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[Intervention Review]

Family and carer smoking control programmes for reducing children's exposure to environmental tobacco smoke

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ABSTRACT

Background

Children's exposure to other people's tobacco smoke (environmental tobacco smoke, or ETS) is associated with a range of adverse health outcomes for children. Parental smoking is a common source of children's exposure to ETS. Older children in child care or educational settings are also at risk of exposure to ETS. Preventing exposure to ETS during infancy and childhood has significant potential to improve children's health worldwide.

Objectives

To determine the effectiveness of interventions designed to reduce exposure of children to environmental tobacco smoke, or ETS.

Search methods

We searched the Cochrane Tobacco Addiction Group Specialised Register and conducted additional searches of the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, PsycINFO, Embase, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), the Education Resource Information Center (ERIC), and the Social Science Citation Index & Science Citation Index (Web of Knowledge). We conducted the most recent search in February 2017.

Selection criteria

We included controlled trials, with or without random allocation, that enrolled participants (parents and other family members, child care workers, and teachers) involved in the care and education of infants and young children (from birth to 12 years of age). All mechanisms for reducing children's ETS exposure were eligible, including smoking prevention, cessation, and control programmes. These include health promotion, social-behavioural therapies, technology, education, and clinical interventions.

Data collection and analysis

Two review authors independently assessed studies and extracted data. Due to heterogeneity of methods and outcome measures, we did not pool results but instead synthesised study findings narratively.

Main results

Seventy-eight studies met the inclusion criteria, and we assessed all evidence to be of low or very low quality based on GRADE assessment. We judged nine studies to be at low risk of bias, 35 to have unclear overall risk of bias, and 34 to have high risk of bias. Twenty-one interventions targeted populations or community settings, 27 studies were conducted in the well-child healthcare setting and 26 in the ill-child healthcare setting. Two further studies conducted in paediatric clinics did not make clear whether visits were made to well- or ill-children, and another included visits to both well- and ill-children. Forty-five studies were reported from North America, 22 from other high-income countries, and 11 from low- or middle-income countries. Only 26 of the 78 studies reported a beneficial intervention effect for reduction of child ETS exposure, 24 of which were statistically significant. Of these 24 studies, 13 used objective measures of children's ETS exposure. We were unable to pinpoint what made these programmes effective. Studies showing a significant effect used a range of interventions: nine used in-person counselling or motivational interviewing; another study used telephone counselling, and one used a combination of in-person and telephone counselling; three used multi-component counselling-based interventions; two used multi-component education-based interventions; one used a school-based strategy; four used educational interventions, including one that used picture books; one used a smoking cessation intervention; one used a brief intervention; and another did not describe the intervention. Of the 52 studies that did not show a significant reduction in child ETS exposure, 19 used more intensive counselling approaches, including motivational interviewing, education, coaching, and smoking cessation brief advice. Other interventions consisted of brief advice or counselling (10 studies), feedback of a biological measure of children's ETS exposure (six studies), nicotine replacement therapy (two studies), feedback of maternal cotinine (one study), computerised risk assessment (one study), telephone smoking cessation support (two studies), educational home visits (eight studies), group sessions (one study), educational materials (three studies), and school-based policy and health promotion (one study). Some studies employed more than one intervention. 35 of the 78 studies reported a reduction in ETS exposure for children, irrespective of assignment to intervention and comparison groups. One study did not aim to reduce children's tobacco smoke exposure but rather sought to reduce symptoms of asthma, and found a significant reduction in symptoms among the group exposed to motivational interviewing. We found little evidence of difference in effectiveness of interventions between the well infant, child respiratory illness, and other child illness settings as contexts for parental smoking cessation interventions.

Authors' conclusions

A minority of interventions have been shown to reduce children's exposure to environmental tobacco smoke and improve children's health, but the features that differentiate the effective interventions from those without clear evidence of effectiveness remain unclear. The evidence was judged to be of low or very low quality, as many of the trials are at a high risk of bias, are small and inadequately powered, with heterogeneous interventions and populations.

PLAIN LANGUAGE SUMMARY

Can interventions for parents and people caring for children reduce children's exposure to tobacco smoke?

Background

Children exposed to cigarette smoke (environmental tobacco smoke) are at greater risk of lung problems, infections, and serious complications including sudden infant death syndrome. Preventing exposure to cigarette smoke in infancy and childhood might significantly improve children's health worldwide. Parental smoking is a common source of cigarette exposure for children. Older children are also at risk of exposure to cigarette smoke in child care or educational settings.

Study characteristics

We searched six databases for relevant research. This is an update of a previously published review, and the date of the most recent search was February 2017. We found 78 studies on the effects of interventions aimed at family and carers with the goal of reducing children's exposure to tobacco smoke. These studies included parents and other family members, child care workers, and teachers involved in the care and education of infants and young children (from birth to 12 years of age), and used a variety of interventions, including different kinds of counselling, brief advice, and educational materials.

Key results

Only 26 studies reported that an intervention was successful in reducing children's exposure to tobacco smoke. These studies used a range of interventions. Nine studies used more intensive counselling methods or motivational interviewing, but in other studies, these

types of interventions were not effective. Of the 52 studies that did not show a significant reduction in child tobacco smoke exposure, 19 used intensive counselling methods or motivational interviewing. One study successfully reduced children's asthma symptoms by using motivational interviewing. This review does not show whether any particular interventions reduced parental smoking and child smoke exposure more effectively than others.

Quality of evidence

The quality of evidence ranged from low to very low. Future studies should aim to provide evidence of higher quality by addressing study design problems, including more participants, and describing interventions in more detail.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON [Explanation]

Community-based interventions for reducing children's exposure to environmental tobacco smoke (ETS)

Patient or population: people who smoke and are involved in the care of young children (birth to 12 years of age)
Settings: community
Intervention: behavioural interventions
Comparison: usual care or minimal intervention

Intervention type and outcomes[1]	Impact	No. of participants[2] (studies)	Quality of the evidence (GRADE)	Comments
Multi-component, counselling-based interventions assessed with biochemical validation of ETS exposure and self-report length of follow-up: 3 to 12 months	Of 7 studies in this group, 3 found that the intervention group was significantly more likely than the control group to implement full home smoking bans. One study found that the geometric mean hair nicotine level in the intervention group significantly decreased from 0.30 ng/mg to 0.23 ng/mg (P = 0.024), but not in the control group. Four studies found no significant differences in the change in cotinine levels between intervention and control groups	2880 (7 studies)	+--- VERY LOW[3]	
Multi-comoponent, education-based interventions assessed with biochemical validation of ETS exposure length of follow-up: 6 months	One study, with similar children's urinary cotinine levels at baseline, found that cotinine levels were significantly lower (Z = -3.136; P = 0.002) in the intervention group (1.29 ng/mL) than in the control group (1.78 ng/mL) at 6 month follow-up. The other study found no significant differences between intervention and control groups in child urine cotinine lev-	307 (2 studies)	+--- VERY LOW[4]	

	els		
In-person counselling (no additional components) assessed with biochemical validation of ETS exposure and self-report length of follow-up: 1 to 12 months	Of the 6 studies in this group, 3 found significantly greater reductions in cotinine levels in the intervention compared with the control group. Two studies found that the intervention group was significantly more likely to implement home smoking bans. Two studies found no significant intervention impacts	1001 (6 studies)	+--- VERY LOW[5]
Telephone counselling assessed with biochemical validation of ETS exposure length of follow-up: 9 months	One study found no significant difference in the proportion of children with low urinary cotinine levels (< 10 ng/mL) amongst parents receiving telephone counselling or a note regarding their child's cotinine result	347 (1 study)	++-- LOW[6]

ETS: environmental tobacco smoke
GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1] Not all studies reported length of follow-up; length given based on those that reported.
[2] Not all studies reported numbers of participants; number provided based on those that reported.
[3] Downgraded two levels due to risk of bias: all studies at unclear or high risk of bias. Downgraded one level due to inconsistency: interventions and populations were clinically heterogeneous.
[4] Downgraded one level due to risk of bias: one of two studies at high risk of bias. Downgraded two levels due to inconsistency: one study detected an effect and one did not; studies were clinically heterogeneous.
[5] Downgraded two levels due to risk of bias: all studies at unclear or high risk of bias. Downgraded one level due to inconsistency: interventions and populations were clinically heterogeneous.
[6] Downgraded one level due to risk of bias: one study at unclear risk of bias. Downgraded one level due to imprecision: only 186 participants with measured outcomes at nine-month follow-up.

BACKGROUND

Active smoking has been recognised as harmful to the smoker for over six decades, since the landmark Doll and Hill publication (Doll 1950), but it was not until 1974 that the medical literature first discussed parental smoking, exposure to environmental tobacco smoke (ETS), and the effects of ETS on children (Harlap 1974). Overwhelming evidence indicates that parental smoking is associated with a range of adverse health effects for children (NHMRC 1997). Perhaps its most obvious association is with increased risk, increased severity, and greater likelihood of admission to hospital of children with lower and upper respiratory tract disease (Strachan 1997; Strachan 1998, respectively). An increasing body of evidence describes an association between parental smoking and increased risk of serious bacterial infections such as meningitis among children (Iles 2001). In addition, Lam 2001 reported that ETS exposure increases health service use and costs, and Chiswell 2017 described associated poorer surgical outcomes.

Furthermore, parental smoking confers a significantly increased risk of sudden infant death syndrome (SIDS) (Golding 1997). This effect is present regardless of which parent is the smoker (Blair 1999), and it is the strongest modifiable risk factor for SIDS. In addition, research across several continents over the last two decades has found that children of smokers have an increased risk of uptake in adolescence, perhaps as a result of role modelling and/or increased access to cigarettes (Mays 2014). There is also an increased risk of respiratory symptoms persisting into adulthood among children exposed to ETS from their parents or carers, but who do not themselves take up smoking later in life (Pugmire 2014).

Parental smoking is a common but preventable source of infant and childhood morbidity. The World Health Organization (WHO) has identified the need to reduce parental smoking as a key element of action to encourage health and development in early childhood, particularly among those living in difficult social and economic circumstances (WHO 1999; WHO 2013). In some countries, strong relationships between socioeconomic status and environmental quality are evident (Moore 2012), and strategies to reduce smoking and improve child health outcomes must be underpinned by recognition of finite resources and the limited control that some individuals and families have over environmental and social situations.

Infants' and toddlers' exposure to smoking occurs primarily within the home environment, as this is where they spend most of their time. Older children may also be exposed to smoking in a variety of child care and educational settings in which they spend their time. As children increase their time spent in commercial and informal child care settings, the importance of child care workers' behaviours increases. Similarly, environments in which young children are exposed extend beyond the home and include shopping centres, meeting places, and other social environments.

Tobacco cessation strategies and interventions to reduce ETS have had mixed success, often providing small benefits on an individual level (Rosen 2014). Systematic reviews have previously demonstrated that individual counselling increases cessation rates (Lancaster 2017), and that simple advice from a physician may have a positive effect in triggering quit attempts (Stead 2013). In relation to children's exposure in utero and during the early years, smoking cessation interventions for pregnant women can be effective in reducing smoking (Coleman 2015; Chamberlain 2017). Although smoke-free legislation in England has contributed to the 79% reduction in children's ETS exposure since 1998 (Jarvis 2015), variability is ongoing, and children in families from lower socioeconomic status remain at greater risk of ETS exposure (Moore 2012). Globally, 80% of the world's smokers live in low- and middle-income countries (WHO 2014), which have demonstrated less political will to enforce smoke-free legislation (Pugmire 2017).

OBJECTIVES

To determine the effectiveness of interventions designed to reduce exposure of children to environmental tobacco smoke, or ETS.

METHODS

Criteria for considering studies for this review

Types of studies

Controlled trials with or without random allocation.

Types of participants

People (parents and other family members, child care workers, and teachers) involved in the care and education of infants and young children (from birth to 12 years of age).

Types of interventions

We included all mechanisms for the reduction of children's ETS exposure, including smoking prevention, smoking cessation, and any other tobacco control programmes targeting the participants described above. These included health promotion, social-behavioural therapy, technology, and educational and clinical interventions.

We included studies in which the primary aim was to reduce children's exposure to ETS (thereby preventing adverse health outcomes), but where secondary outcomes included reduction or cessation of familial/parental/carer smoking, or changes in infant and

child health measures. We also included studies where the primary outcome was reduction or cessation of familial/parental/carer smoking, resulting in reduced exposure for children.
We excluded studies on uptake of smoking by minors.
We did not restrict inclusion based on who delivered the programmes. These could include researchers, general practitioners, midwives, paediatricians, community and hospital nurses, health promotion agencies, tobacco control and anti-cancer organisations, or health departments.

Types of outcome measures

The primary outcome measures were children's exposure to tobacco smoke, child illness and health service utilisation, and the smoking behaviours of children's parents and carers. We included studies where the only outcome was parental or carer smoking status.
We used biological verification of exposure to or absorption of ETS as the 'gold standard', but we did not require this as an inclusion criterion. Where biological verification of exposure/absorption conflicted with the parental report of exposure, we regarded the biologically verified result as correct.

Outcomes for children

- Exposure to ETS: biochemical measures of children's exposure to ETS based on air monitoring for levels of nicotine or other measures of ETS (including parent-reported behaviour change, as described in the next section)
- Absorption of ETS: biochemical measures of children's absorption of ETS through cotinine in urine, blood, saliva, or hair
- Frequency of childhood illness events, respiratory problems (changes in lung function or symptom scores)
- Use of health services: admission to hospital; frequency of use of general practitioners (GPs); frequency of medication use

Outcomes for parents and carers

- Behaviour change in relation to children's exposure to ETS: We noted any reported bans or restrictions on smoking at home or in other environments or in designated smoking areas outside the home
- Smoking behaviour, including cessation, reduction, or uptake, using biochemically validated measures of smoking behaviour (e.g. thiocyanates; cotinine levels in blood, urine, or saliva), or self-report
- Maternal postpartum smoking status
- Costs and cost-effectiveness associated with interventions and outcomes

We reported biochemical confirmation of parental self-reported quit status or changes in behaviour such as moves to smoke outside, but we did not exclude studies without this measurement. Most studies did not use biochemical validation. However, there is conflicting evidence regarding the validity of self-report of smoking status. Some trial authors suggest that self-report is reasonably accurate in community settings (Dwyer 1986; Velicer 1992; Patrick 1994), whereas others suggest that parental self-reports of smoke consumption and ETS are frequently underestimated (Jarvis 1987; Ford 1997; Matthews 1999). For example, in clinical situations where a clinician is the interviewer, social bias may influence the report towards the socially desired response.
Researchers and clinicians often prefer to use levels of nicotine or its breakdown products, by contrast, as a measure of real reductions in smoking or ETS. Cotinine is a metabolic breakdown product of nicotine with a half-life of about one day (Haley 1983). Its half-life is longer in non-smokers such as infants and young children (Idle 1990). Smoke exposure can be detected by hair cotinine (Zahlsen 1994; Nafstad 1997; Al-Delaimy 2002a; Al-Delaimy 2002b), and absorption by urinary cotinine (Jarvis 1984; Bakoula 1995). Long-term exposure is best estimated by hair cotinine, whereas urinary cotinine is more informative of short-term exposure. Saliva cotinine approximates to blood cotinine concentrations, and collection is simple and non-invasive.

Search methods for identification of studies

This is the fourth update of this review. Search methods for the previous searches are described in previously published versions of this review (Roseby 2002; Priest 2008; Baxi 2014).
Nia Wyn Roberts, Outreach Librarian, Bodleian Health Care Libraries, updated the search. We searched the Cochrane Central Register of Controlled Trials (Issue 2011) in the Cochrane Library, MEDLINE (OvidSP) (1948 to the present), Embase (OvidSP) (1974 to the present), the Cumulative Index to Nursing and Allied Health Literature (CINAHL) (EbscoHOST) (1980 to the present), PsycINFO (OvidSP) (1967 to the present), and the Education Resource Information Center (ERIC) (ProQuest) (1966 to the present). In June 2011, we conducted a search for articles from 2007 to 2011. The Trial Search Co-ordinator searched the CochraneTobacco Addiction Group Specialised Register. We conducted the most recent search in February 2017.
We obtained and reviewed reports of all references identified as possibly describing randomised controlled trials (RCTs) or controlled trials (CTs), and we checked the reference lists of all identified RCTs and CTs to identify potentially relevant citations. We made enquiries regarding other known published and unpublished studies so that we could include these results in our review.
We have presented search strategies for the key databases in Appendix 1 (MEDLINE); Appendix 2 (Embase); Appendix 3 (CINAHL); Appendix 4 (PsycINFO); Appendix 5 (ERIC); and Appendix 6 (the Cochrane Library).

Data collection and analysis

Two review authors (BB and MS) independently screened studies for inclusion using Covidence. Three review authors independently undertook assessment of quality and extraction of included study details and results. For this update, BB reviewed all studies; and MS, RB, and RR each reviewed one-third of the studies and compared results. We created a data extraction spreadsheet in Microsoft Excel.

We extracted information on methods, participants, intervention and control conditions, and outcomes. We were particularly interested in aspects of intervention development that may have contributed to a stronger, more appropriate or sustained intervention. We extracted information on the theory underlying the intervention development and content, process indicators and descriptions of community consultation and/or participation in the planning and implementation of the intervention, incentives (if present), and concerns regarding intervention programmes. We also recorded any information about costs, either in terms of evaluations of cost-effectiveness, or simply where costs were mentioned. Where possible, we examined outcomes by gender, age, and socioeconomic status.

We resolved differences between reviewers' screening and extraction results by discussion or by consultation with a third review author. Given the heterogeneity of study design and characteristics, we considered a quantitative estimate of effect to be inappropriate and therefore provided a narrative synthesis.

Assessment of risk of bias in included studies

Two review authors independently assessed risk of bias for all included studies, including those included in previous versions of this review. We categorised risk of bias as high, low, or unclear for randomisation, allocation concealment, incomplete data, blinding of outcome assessment, and other bias, in accordance with methods described in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We resolved differences by discussion.

Sequence generation (checking for possible selection bias)

We have described the methods used to generate the allocation sequence and have assessed these methods as having:

- low risk of bias (any truly random process, e.g. random number table, computer random number generator);
- high risk of bias (any non-random process, e.g. odd or even date of birth, hospital or clinic record number); or
- unclear risk of bias (insufficient information provided with which to judge).

Allocation concealment (checking for possible selection bias)

We have described the methods used to conceal the allocation sequence in sufficient detail to determine whether intervention allocation could have been foreseen in advance of, or during, recruitment, or changed after assignment. We have assessed these methods as having:

- low risk of bias (e.g. telephone or central randomisation; consecutively numbered sealed opaque envelopes);
- high risk of bias (open allocation; unsealed or non-opaque envelopes; alternation; date of birth); or
- unclear risk of bias (insufficient information provided with which to judge).

Blinding (checking for possible detection bias)

We have described the methods reported, if any, to blind study participants and personnel from knowledge of which intervention a participant received. With educational interventions (such as those assessed in this review) it is often not possible to blind participants to group allocation, and hence we did not evaluate blinding based on performance bias but rather based solely on the potential to introduce detection bias. It is possible for outcome assessors to be blinded to group allocation and we have noted where there was partial blinding. We have assessed study methods as having high risk of bias, low risk of bias, or unclear risk.

When investigators objectively measured findings (e.g. biochemical validation, household air nicotine monitors), we assessed blinding as adequate to prevent detection bias.

Incomplete outcome data (checking for possible attrition bias through withdrawals, dropouts, or protocol deviations)

Within each included study, we have described for each outcome or class of outcomes the completeness of data, including attrition and exclusions from analysis. We have noted whether attrition and exclusions were reported, the numbers included in the analysis at each stage (compared with the total number of randomised participants), reasons for attrition or exclusion where reported, and whether missing data were balanced across groups.

Other bias (e.g. selective reporting bias)

We have noted any other potential sources of bias that were not related to the four sources discussed above.

Overall risk of bias

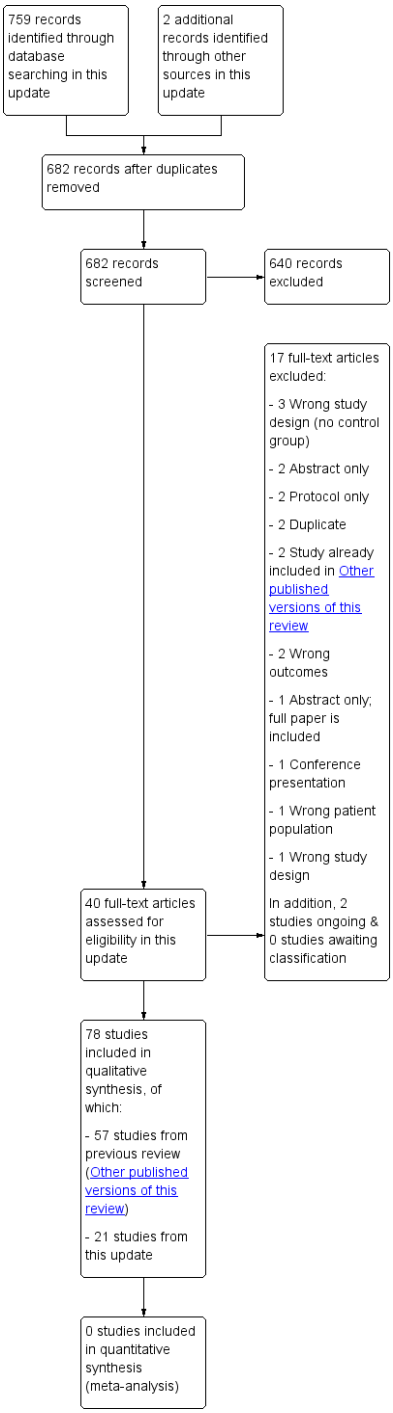
We made explicit judgements about whether studies were at high, moderate, or low risk of bias, according to the criteria given in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). With reference to the specific types of bias discussed above, we assessed the likely magnitude and direction of bias, and whether we considered it likely to impact study findings.

RESULTS

Description of studies

We included 78 studies in this review, 21 of which were identified in the most recent update; see the search study flow diagram in Figure 1 (Abdullah 2015; Blaakman 2015; Borrelli 2016; Chen 2016; Collins 2015; Cooper 2014; Daly 2016; Eakin 2014; Hafkamp-de 2014; Harutyunyan 2013; Joseph 2014; Kegler 2015; Nicholson 2015; Ortega 2015; Pollak 2015; Schuck 2014; Streja 2014; Ulbricht 2014; Walker 2015; Wang 2015; Yucel 2014). We have summarised the characteristics of included studies below, and have provided further detail in the Characteristics of included studies table.

Figure 1. Study flow diagram.



We identified five additional studies for which outcome data are not yet available; we identified three of these in the previous update (Johnston 2010; Rosen 2011; Wagener 2012; Hutchinson 2013; Risica 2016). We have provided information about these ongoing studies in the Characteristics of ongoing studies table.

We have listed 35 studies as excluded. The most common reasons for exclusion were study design; participants not meeting inclusion criteria; outcomes not related to environmental tobacco smoke exposure; and lack of outcome data. Further information is available in the Characteristics of excluded studies table.

Intervention setting

One study evaluated outcomes for smoking mothers who called a telephone smoking cessation assistance counselling service (Davis 1992), and another recruited participants from callers to a 2-1-1 service (Kegler 2015). Seven studies introduced interventions in a school setting (Zhang 1993; Elder 1996; Ekerbicer 2007; Halterman 2011; Schuck 2014; Wang 2015; Chen 2016). Five further studies introduced interventions in other community settings (Conway 2004; Herbert 2011; Prokhorov 2013; Eakin 2014; Ulbricht 2014; see Characteristics of included studies for futher details).

Eight studies recruited from general healthcare settings (Harutyunyan 2013; Streja 2014; Yucel 2014; Abdullah 2015; Blaakman 2015; Collins 2015; Pollak 2015; Walker 2015; see Characteristics of included studies for futher details). Twenty-five studies took place in well-child healthcare settings, and recruited participants postnatally, at well-child health visits or at infant immunisation clinics. Fourteen of these studies were peripartum, recruiting participants via maternity hospitals, from their records, or through midwives and general practitioners (Woodward 1987; Greenberg 1994; Severson 1997; Armstrong 2000; Van't Hof 2000; Emmons 2001; Ratner 2001; Pulley 2002; Schonberger 2005; Wiggins 2005; Culp 2007; French 2007; Hannover 2009; Cooper 2014). Chilmonczyk 1992, Vineis 1993, Eriksen 1996, Fossum 2004, Zakarian 2004, Abdullah 2005, Kallio 2006, Winickoff 2010, Baheiraei 2011, Hafkamp-de 2014, Joseph 2014, and Daly 2016 used well-child health check visits to a doctor or maternal child health nurse. Chellini 2013 recruited from hospital and public health facility waiting rooms, as well as from supermarkets.

Twenty-six studies reported interventions conducted in an ill-child healthcare setting. Fourteen of these identified families through their children's respiratory problems (Hughes 1991; McIntosh 1994; Wahlgren 1997; Irvine 1999; Wilson 2001; Hovell 2002; Krieger 2005; Ralston 2008; Borrelli 2010; Butz 2011; Halterman 2011 (recruited from school rather than healthcare setting); Wilson 2011; Stotts 2012; Borrelli 2016). Investigators conducted 10 studies in non-respiratory ill-child healthcare settings (Groner 2000; Hovell 2000; Wakefield 2002; Kimata 2004; Chan 2005; Chan 2006a; Hovell 2009; Phillips 2012; Tyc 2013; Nicholson 2015). Patel 2012 and Ralston 2013 targeted children presenting to the emergency department, approximately 40% of whom had a respiratory presenting complaint. Hovell 2000 and Hovell 2009 recruited mothers from a Special Supplemental Nutrition Program for Women, Infants, and Children, and looked at the effectiveness of counselling on smoking rates and children's ETS exposure among women of low income, high risk, and ethnically diverse backgrounds.

Two additional studies conducted in paediatric clinics did not specify whether they were conducted in the context of well-child or ill-child health visits (Curry 2003; Nuesslein 2006), and Yilmaz 2006 recruited children visiting paediatric clinics for treatment of primary conditions or for a well-child visit.

Main target of intervention

Children's ETS exposure can be reduced by encouraging avoidance of children's exposure to cigarettes smoked, for example, by moving the child or the smoker to a different location, reducing the number of cigarettes smoked by the parent or carer, or having the smoker cease smoking altogether. The aims of studies identified by this review were heterogeneous. Here, we consider only smoking and ETS targets; we do not describe other intervention components, such as healthy eating (e.g. Elder 1996), asthma management (e.g. Hughes 1991), or household safety (e.g. Culp 2007).

Of the 78 included studies, 18 aimed solely for parental or carer smoking cessation or reduction (Vineis 1993; Zhang 1993; Severson 1997; Groner 2000; Emmons 2001; Wakefield 2002; Curry 2003; Kimata 2004; Chan 2005; Wiggins 2005; Kallio 2006; Nuesslein 2006; Ralston 2008; Borrelli 2010; Ralston 2013; Cooper 2014; Pollak 2015; Borrelli 2016). Twenty-five studies aimed solely for reducing children's exposure to cigarettes smoked (Chilmonczyk 1992; Davis 1992; Elder 1996; Wahlgren 1997; Hovell 2000; Wilson 2001; Pulley 2002; Baheiraei 2011; Butz 2011; Herbert 2011; Wilson 2011; Stotts 2012; Chellini 2013; Prokhorov 2013; Tyc 2013; Harutyunyan 2013; Hafkamp-de 2014; Schuck 2014; Streja 2014; Ulbricht 2014; Collins 2015; Kegler 2015; Nicholson 2015; Ortega 2015; Chen 2016), while 30 studies aimed for a combination of parental or carer cessation, reduction, or avoidance (Woodward 1987; Hughes 1991; Greenberg 1994; McIntosh 1994; Eriksen 1996; Irvine 1999; Armstrong 2000; Hovell 2000; Conway 2004; Fossum 2004; Zakarian 2004; Abdullah 2005; Krieger 2005; Schonberger 2005; Chan 2006a; Yilmaz 2006; Culp 2007; Ekerbicer 2007; Hovell 2009; Winickoff 2010; Halterman 2011; Patel 2012; Eakin 2014; Joseph 2014; Yucel 2014; Abdullah 2015; Blaakman 2015; Walker 2015; Wang 2015; Daly 2016). Five studies aimed to prevent reuptake of smoking postpartum (Van't Hof 2000; Ratner 2001; French 2007;

Hannover 2009; Phillips 2012).

All studies aimed to achieve changes in behaviour in some way to reduce child ETS exposure. Eleven studies did not expressly include an educational or knowledge-building component in their interventions but instead targeted change in attitudes and behaviours (Chilmonczyk 1992; Zhang 1993; Wahlgren 1997; Hovell 2000; Curry 2003; Zakarian 2004; Chan 2005; Nuesslein 2006; Cooper 2014; Abdullah 2015; Ortega 2015).

Location of studies

Most studies were reported from high-income countries. Forty-five studies were from North America, with 42 from the USA and three from Canada. Four studies were from Australia, and one was conducted in both Australia and New Zealand (Walker 2015). Three studies were from each of the UK, Germany, and the Netherlands. Two studies were from Italy (Vineis 1993; Chellini 2013). One study was reported from each of Finland (Kallio 2006), Japan (Kimata 2004), Sweden (Fossum 2004), Norway (Eriksen 1996), Taiwan (Chen 2016), and Spain (Ortega 2015). Fifteen of the studies conducted in high-income countries specifically targeted disadvantaged, low-income, and/or culturally diverse populations. Eleven studies were reported from low- or middle-income countries, with six from China (Zhang 1993; Abdullah 2005; Chan 2005; Chan 2006a; Abdullah 2015; Wang 2015), three from Turkey (Yilmaz 2006; Ekerbicer 2007; Yucel 2014), and one from each of Iran (Baheiraei 2011) and Armenia (Harutyunyan 2013).

Participants

Twenty-four studies targeted mothers only. Hovell 2009, Yucel 2014, and Pollak 2015 targeted mothers but invited partners or other family members to participate in counselling. One study targeted fathers by educating their non-smoking wives (Chan 2006a). Thirty-six studies targeted both parents. Zhang 1993 targeted fathers only; Borrelli 2010, Wilson 2011, Patel 2012, and Ralston 2013 targeted carers; Elder 1996 targeted teachers only; Wahlgren 1997, Butz 2011, and Stotts 2012 targeted families; and Krieger 2005, Halterman 2011, Harutyunyan 2013, Prokhorov 2013, and Kegler 2015 targeted households.

Age group

We stratified studies according to age groups of children: infants (younger than one year); preschoolers (up to age six); and school age (six to twelve years). Twenty-three studies examined measures to reduce ETS exclusively for infants. Nineteen studies examined measures to reduce ETS for children up to and including preschool age, and 18 studies considered measures for children up to and including school age. One study followed pregnant women between 13 and 29 weeks' gestation for 12 months (Pollak 2015). Eight studies examined interventions to reduce ETS that included older age groups: Wahlgren 1997 included parents of children aged 6 to 17 years; Hovell 2002 and Borrelli 2016 included parents of children aged 3 to 17 years; Chan 2006a included parents of children from birth to 15 years; Yilmaz 2006 included mothers of children younger than 16 years of age; Streja 2014 included parents or guardians of children from 2 to 14 years of age; and Borrelli 2010, Chellini 2013, Prokhorov 2013, Tyc 2013, Kegler 2015, and Nicholson 2015 included children younger than 18 years of age. Five studies did not provide children's ages (Curry 2003; Chan 2005; Nuesslein 2006; Ralston 2008; Ralston 2013).

Theoretical framework

Forty-five of the 78 studies expressly employed a theoretical framework in the design and/or development of the intervention. Fifteen studies used motivational interviewing (Emmons 2001; Curry 2003; Chan 2005; French 2007; Hannover 2009; Borrelli 2010; Baheiraei 2011; Halterman 2011; Phillips 2012; Stotts 2012; Ralston 2013; Eakin 2014; Blaakman 2015; Kegler 2015; Borrelli 2016). Seven used a social learning model (Greenberg 1994; Elder 1996; Conway 2004; Fossum 2004; Harutyunyan 2013; Ulbricht 2014; Blaakman 2015), and six used the stages of change component of Prochaska's transtheoretical model (Abdullah 2005; Krieger 2005; Ralston 2008; Winickoff 2010; Patel 2012; Ralston 2013). Chen 2016 combined transtheoretical and I-change models, and Winickoff 2010 combined the transtheoretical stages of change model with social learning theory, the health beliefs model, cognitive-behavioural theory, Wagner's chronic care model, and behavioural and systems theory. Several studies combined motivational interviewing with other frameworks, including stages of change (Ralston 2013; Wang 2015), Maori and Aboriginal holistic models of health (Walker 2015), the teachable moment (Borrelli 2016), cognitive-behavioural therapy (Joseph 2014), cognitive-behavioural skill building (Schuck 2014), and social cognitive theory. Kegler 2015 combined motivational interviewing with both the transtheoretical stages of change model and social cognitive theory, while Pollak 2015 combined motivational interviewing with both the teachable moment model and cognitive-behavioural couples therapy.

McIntosh 1994 developed activities for the parent manual based on behaviour modification theory. Wahlgren 1997 tailored the programme to individual families and incorporated several behavioural modification techniques, including stimulus control, shaping, personal feedback, and contingency contracting. Groner 2000 employed the health belief model, and Wakefield 2002 used a harm minimisation approach that was based on previous research indicating that restrictions produced significantly lower urinary cotinine levels. Ratner 2001 utilised Marlatt's relapse model. Chan 2006a used Fishbein's theory of reasoned action and Ajzen's theory of planned behaviour in developing its educational intervention. Hovell 2009 used the behavioural ecological model in developing the counselling intervention. Herbert 2011 used a family-centred assessment and intervention model to empower families to reduce

cigarettes smoked in the home. Tyc 2013 and Nicholson 2015 used behavioural contracting, problem solving, and social reinforcement. Ortega 2015 used the 5 As (Ask, Advise, Assess, Assist, and Arrange) approach, and Streja 2014 employed the Health Behaviour Framework (previously the Adherence Model).

Acceptability of intervention to participants

Six studies appear to have involved consultation with potential participants as part of the development of the intervention (Hughes 1991; Davis 1992; Hovell 2000; Borrelli 2010; Streja 2014; Chen 2016). Davis 1992 employed focus groups with smokers and non-smokers to understand their beliefs and attitudes towards smoking and cessation in order to develop improved self-help materials. Borrelli 2010 conducted focus groups to better understand Latino culture and to modify the motivational interviewing technique accordingly.

Process indicators

Process indicators provide important information regarding the integrity of the way in which interventions were implemented. However, only 32 of the 78 studies described process indicators well (Hughes 1991; Chilmonczyk 1992; Davis 1992; Greenberg 1994; McIntosh 1994; Eriksen 1996; Severson 1997; Hovell 2000; Emmons 2001; Hovell 2002; Wakefield 2002; Fossum 2004; Zakarian 2004; Abdullah 2005; Wiggins 2005; Culp 2007; Hannover 2009; Hovell 2009; Borrelli 2010; Winickoff 2010; Stotts 2012; Tyc 2013; Cooper 2014; Eakin 2014; Hafkamp-de 2014; Joseph 2014; Schuck 2014; Abdullah 2015; Blaakman 2015; Kegler 2015; Borrelli 2016; Daly 2016). More specifically, 11 studies reported that they maintained regular monitoring and support with those responsible for providing the intervention (Hughes 1991; Greenberg 1994; Emmons 2001; Culp 2007; Hannover 2009; Hovell 2009; Borrelli 2010; Eakin 2014; Hafkamp-de 2014; Abdullah 2015; Daly 2016), and 19 reported that they evaluated the extent to which participants received, read, undertook, or adhered to the intervention as intended (Davis 1992; McIntosh 1994; Severson 1997; Hovell 2002; Wakefield 2002; Zakarian 2004; Abdullah 2005; Wiggins 2005; Culp 2007; Hovell 2009; Winickoff 2010; Stotts 2012; Cooper 2014; Joseph 2014; Schuck 2014; Abdullah 2015; Blaakman 2015; Kegler 2015; Borrelli 2016). Among those that commented on the monitoring of study implementation, one study recommended prompting providers over the course of the study to ensure appropriate implementation (Severson 1997). Another study reported the collection of qualitative data showing the opinions of nurses delivering the intervention (Fossum 2004).

Biological verification of children's exposure and absorption

Thirty studies used biological evidence of children's ETS absorption by measuring cotinine in urine or saliva, and 14 studies used environmental monitors of children's exposure to ETS. Eight of the 14 used passive sampling nicotine monitors as a primary study outcome. One study also measured particulate matter in the child's bedroom and living room (Butz 2011). The remaining studies used air nicotine monitors to promote or verify the accuracy of parent reporting of smoking behaviours. Wahlgren 1997 reported using air nicotine monitors in a room where greatest exposure to ETS was reported for two weeks before clinic visits to verify parent reports of cigarette consumption. Hovell 2000, Hovell 2002, Zakarian 2004, and Hovell 2009 used inactive air nicotine monitors placed in three rooms where children's greatest ETS exposure was reported, to promote accurate self-reporting of smoking behaviours by mothers. These studies also placed active air monitors for a selected proportion of the total sample: Hovell 2000 in a randomly selected half of the sample; both Hovell 2002 and Zakarian 2004 in 20% of the sample; and Hovell 2009 in a randomly selected 24% of the sample at six months. Zakarian 2004 reported randomly selecting these homes and placing monitors in the homes one week before data collection, while Hovell 2002 did not report how the 20% of homes were selected but reported that they were used only for baseline and post-test measures. Cost was given as a reason for not using active air nicotine monitors across the whole sample. Eakin 2014 placed two monitors for seven days in the room where the child slept and in another room identified as a major activity room by the carer. Streja 2014 placed two monitors, each for one of two consecutive seven-day periods in a major activity room. Kegler 2015 used passive air monitors after the three-month visit for all participants reporting full or no bans, and for half of the participants reporting partial bans. However, investigators did not specify the location of the monitors. Borrelli 2016 placed two monitors for seven days at baseline and after call 5, they placed one in the room where the child spent the most time, and the child wore one.

Eleven interventions used feedback to parents of biological evidence of children's ETS absorption as a stimulus for parental behaviour change (Chilmonczyk 1992; McIntosh 1994; Wilson 2001; Wakefield 2002; Ekerbicer 2007; Wilson 2011; Harutyunyan 2013; Ulbricht 2014; Yucel 2014; Wang 2015; Daly 2016). Twenty-three studies used biological validation of parental smoking cessation by measuring cotinine in urine, saliva, or serum (Woodward 1987; Irvine 1999; Hovell 2000; Hovell 2002; Fossum 2004; Zakarian 2004; Abdullah 2005; Kallio 2006; Nuesslein 2006; French 2007; Hovell 2009; Winickoff 2010; Phillips 2012; Tyc 2013; Cooper 2014), and/or expired carbon monoxide (Emmons 2001; Ratner 2001; Curry 2003; Abdullah 2005; Schonberger 2005; Borrelli 2010; Stotts 2012; Cooper 2014).

Length of follow-up

For this review we determined length of follow-up as extending from completion of the intervention to time of data collection. Length of follow-up is important to determine, as it affects the extent to which sustainability and long-term outcomes can be assessed. While short-term reductions in children's ETS exposure have provided some benefit for children's health outcomes, the ultimate goal is long-term and sustained change in order to maximise the positive impact on children's health and well-being as they grow and develop. Twenty-eight studies included in this review reported follow-up of at least 12 months from the end of the intervention. Another 24 studies reported shorter follow-up periods of between 6 and 12 months. Wahlgren 1997 debriefed participants at the six-month follow-up and reported ongoing follow-up 8 and 18 months after that. Long-term effectiveness was particularly difficult to assess in the remaining studies, specifically those with follow-up periods of six months or less. McIntosh 1994 reported follow-up periods that ranged between four and six months. Stotts 2012 reported a follow-up period of six months from baseline, but it was unclear what the follow-up was post intervention. The remaining studies (24) used a follow-up time of less than six months.

Sample size

Thirty-nine of the 78 studies mention conducting a power calculation in the design of their studies (Woodward 1987; Greenberg 1994; McIntosh 1994; Severson 1997; Wahlgren 1997; Irvine 1999; Armstrong 2000; Groner 2000; Hovell 2000; Emmons 2001; Wakefield 2002; Conway 2004; Krieger 2005; Schonberger 2005; Wiggins 2005; French 2007; Ralston 2008; Hannover 2009; Hovell 2009; Borrelli 2010; Baheiraei 2011; Butz 2011; Halterman 2011; Wilson 2011; Phillips 2012; Chellini 2013; Harutyunyan 2013; Prokhorov 2013; Ralston 2013; Cooper 2014; Ulbricht 2014; Abdullah 2015; Ortega 2015; Pollak 2015; Walker 2015; Wang 2015; Borrelli 2016; Chen 2016; Daly 2016). Of these, McIntosh 1994, Wahlgren 1997, Borrelli 2010, Harutyunyan 2013, Cooper 2014, Pollak 2015, and Daly 2016 explicitly mention that the statistical power of their study was limited by the small sample size. Although Streja 2014 did not present a power calculation, the authors did include a lack of statistical power as one of their limitations.

Risk of bias in included studies

To meet inclusion criteria for this review, studies had to be controlled trials. For this update, we assessed risk of bias for all of the included studies. We have summarised this assessment in Figure 2 and Figure 3.

Figure 2. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

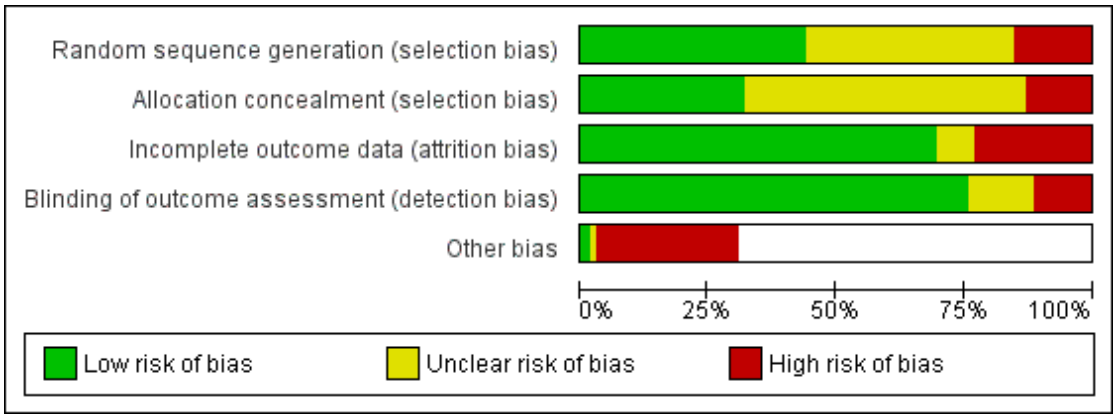
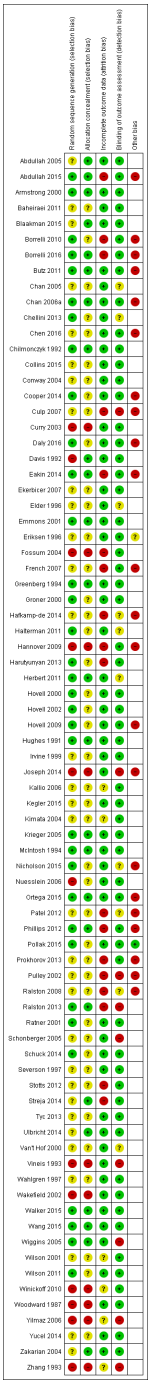


Figure 3. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.



Allocation

Investigators rarely described the method of randomisation in sufficient detail to permit assessment of whether allocation was concealed at the time of trial entry. For example, it was common for studies to merely state that participants were randomised. Quasi-randomisation was not uncommon even in large trials. Twelve and 32 studies, respectively, were at high and unclear risk of bias from poor randomisation and lack of randomisation. Ten and 43 studies, respectively, were at high and unclear risk of bias from allocation concealment, with many studies not describing allocation concealment.

Blinding (detection bias)

Very few trials had any blinding of participants or providers, largely due to pragmatic issues associated with administering an educational intervention. We have noted in the Characteristics of included studies tables where there was blinding of outcome assessors. We classified those trials without adequate blinding of outcome assessors or that used a subjective measure of outcome assessment as having high risk of bias. Nine and 10 studies, respectively, were at high and unclear risk of bias from blinding of outcome assessment.

Incomplete outcome data

Attrition from withdrawals and exclusions from trials were common, and often studies did not clearly specify the reasons for this. Attrition presents a potentially serious risk of bias in these studies. We have provided in the Characteristics of included studies table levels of attrition for each study, and information about any intention-to-treat analyses performed. Eighteen and six studies, respectively, were at high and unclear risk of bias due to incomplete outcome data.

Other potential sources of bias

We judged 22 studies to be at high risk of "other potential sources of bias". In 12 of these studies, this related to systematic differences in the characteristics of treatment groups (Pulley 2002; Culp 2007; French 2007; Ralston 2008; Hovell 2009; Butz 2011; Phillips 2012; Prokhorov 2013; Hafkamp-de 2014; Abdullah 2015; Ortega 2015; Borrelli 2016). In four studies, this was due to potential exposure misclassification (Eakin 2014; Hafkamp-de 2014; Joseph 2014; Daly 2016); in four this was due to a lack of intention-to-treat analysis (Pulley 2002; Hannover 2009; Patel 2012; Prokhorov 2013); in three this was due to the possibility of contamination between groups (Chan 2006a; Hafkamp-de 2014; Abdullah 2015); in one it was due to a Hawthorne effect (Ortega 2015); and in another to the possibility of social desirability bias resulting from the interview format (Abdullah 2015).

Effects of interventions

See: **Summary of findings for the main comparison** Summary of findings: community-based interventions for reducing children's exposure to environmental tobacco smoke; **Summary of findings 2** Summary of findings: interventions in the ill-child setting for reducing children's exposure to environmental tobacco smoke; **Summary of findings 3** Summary of findings: interventions in the well-child setting for reducing children's exposure to environmental tobacco smoke

We provide study results by outcome and by setting and child age below. We have discussed specific intervention types within individual outcomes, and more generally in the Discussion section. For further information, including effect sizes of interventions, see Analysis 1.1.

Tobacco smoke exposure outcomes

Of the 78 studies, 26 reported success in achieving reduced children's ETS exposure between intervention and control groups, 24 of which presented statistically significant findings (N = 33,811). Thirteen (N = 3640) used biochemical or environmental measures of children's ETS exposure (biological verification of cotinine in urine or saliva of the child, or use of environmental monitors) (Wahlgren 1997; Emmons 2001; Kimata 2004; Borrelli 2010; Baheiraei 2011; Harutyunyan 2013; Prokhorov 2013; Collins 2015; Kegler 2015; Ortega 2015; Wang 2015; Borrelli 2016; Chen 2016) and 11 (N = 30,171) did not use such measures (Zhang 1993; Armstrong 2000; Curry 2003; Abdullah 2005; Schonberger 2005; Yilmaz 2006; French 2007; Phillips 2012; Hafkamp-de 2014; Abdullah 2015; Blaakman 2015). Of these, we judged 11 to be at high risk of bias, three at low risk of bias, and 10 at unclear risk of bias. We provide a brief summary of outcomes below, along with further details of available outcome measures in the section Analysis 1.1.

Of the 13 studies using biochemical or environmental measures of children's ETS exposure, five (N = 645) reported children's urinary cotinine measures (Kimata 2004; Baheiraei 2011; Collins 2015; Wang 2015; Chen 2016), two (N = 1351) reported children's hair nicotine measures (Harutyunyan 2013; Ortega 2015), and six (N = 1644) recorded household air nicotine assessed with monitors (Wahlgren 1997; Emmons 2001; Borrelli 2010; Prokhorov 2013; Kegler 2015; Borrelli 2016). Seven (N = 1580) of these 13 studies used in-person counselling (Wahlgren 1997; Emmons 2001; Borrelli 2010; Baheiraei 2011; Collins 2015; Borrelli 2016; Chen 2016), two (N = 748) used complex interventions consisting of counselling plus additional components (Harutyunyan 2013;

Kegler 2015), one (N = 65) used a complex intervention consisting of education plus additional components (Wang 2015), one (N = 1101) used a brief intervention (Ortega 2015), and one (N = 71) used "fotonovelas" and a comic book (Prokhorov 2013). In one study (N = 75) intervention methods are unclear as investigators do not describe how they encouraged participants to stop smoking, but do state that those in the intervention group "agreed to stop smoking" (Kimata 2004).

Eight studies reported success based on parents' reports of smoking cessation, with or without salivary cotinine verification, or reduction in smoking in the presence of children but without verification of children's ETS exposure. These studies employed a range of interventions including school-based interventions (children writing letters to their fathers urging them to quit), intensive counselling, a home visiting programme, education and advice, and an intervention based on the Behavioural Action Model (BAM). Zhang 1993 (N = 19,533) used a school-based intervention and reported the proportion of fathers who quit smoking for at least 180 days as 800/9953 (11.7%) for the intervention group, and as 14/6274 (0.2%) for the control group. At follow-up, Armstrong 2000 (N = 181) reported smoking in the house around an infant (maternal self-report) for the intervention group as 8.6% and for the control group as 23.8% when the intervention group received a home visiting programme. Curry 2003 (N = 303) reported smoking abstinence at 12 months as 13.5% in the intervention group, following a brief motivational message and telephone counselling, and as 6.9% in the control group. Abdullah 2005 (N = 952) used telephone counselling and reported a biochemically validated quit rate of 47/444 (10.6%) for the intervention group and 21/459 (4.5%) for the control group at six months. Schonberger 2005 (N = 476) reported that 52% (14/27) of postnatal mothers quit smoking in the intervention group, compared with 28% (8/30) in the control group, at six months' follow-up when the intervention group received home visits. Yilmaz 2006 (N = 363) included two intervention groups that had discussions about effects of smoking on child or maternal health. Quit rates at follow-up were as follows: child intervention group 24.3%; mother intervention group 13%; and control group 0.8%. French 2007 (N = 61) used motivational interviewing; and at six months' follow-up, 26 (22%) participants in the intervention group and 9 (10%) in the control group were saliva cotinine-verified non-smokers. Phillips 2012 (N = 44) used motivational interviewing for both groups, and provided information about infant bonding to the intervention group. The study reported that at eight weeks postpartum, there were significantly more smoke-free mothers in the intervention (81%) group compared with the control (46%) group.

Fifty-two studies (N = 19,758) failed to detect an intervention effect on ETS outcomes (Woodward 1987; Hughes 1991; Chilmonczyk 1992; Davis 1992; Vineis 1993; Greenberg 1994; McIntosh 1994; Elder 1996; Eriksen 1996; Severson 1997; Irvine 1999; Groner 2000; Hovell 2000; Van't Hof 2000; Ratner 2001; Wilson 2001; Hovell 2002; Pulley 2002; Wakefield 2002; Conway 2004; Fossum 2004; Zakarian 2004; Chan 2005; Krieger 2005; Wiggins 2005; Chan 2006a; Kallio 2006; Nuesslein 2006; Culp 2007; Ekerbicer 2007; Ralston 2008; Hannover 2009; Hovell 2009; Winickoff 2010; Butz 2011; Halterman 2011; Herbert 2011; Wilson 2011; Stotts 2012; Chellini 2013; Patel 2012; Ralston 2013; Tyc 2013; Cooper 2014; Eakin 2014; Joseph 2014; Schuck 2014; Streja 2014; Yucel 2014; Pollak 2015; Walker 2015; Daly 2016). Three (N = 824) of these studies reported significant reduction in self-reported parental smoking based on intensive counselling without a corresponding reduction in children's urinary cotinine measurements (Hovell 2000; Hovell 2009; Schuck 2014). In Culp 2007 (N = 263), the intervention group received home visits, and whilst there was no significant reduction in smoking, the other outcome of relevance to our review was mothers' knowledge of the effects of smoking on child development. At 12 months, the intervention group answered two out of six questions better than the control group.

In all, 21 of these 52 studies (N = 6485) used biochemical measures of children's ETS exposure (child urinary, hair, or salivary cotinine levels) (Woodward 1987; Chilmonczyk 1992; Greenberg 1994; McIntosh 1994; Irvine 1999; Hovell 2000; Wilson 2001; Hovell 2002; Wakefield 2002; Conway 2004; Zakarian 2004; Kallio 2006; Ekerbicer 2007; Hovell 2009; Halterman 2011; Wilson 2011; Tyc 2013; Eakin 2014; Streja 2014;Yucel 2014; Walker 2015), while the rest used self-reports of smoking behaviour, with or without salivary cotinine verification. Interventions used in these studies were varied; 29 studies (N = 8930) used complex interventions predominantly including counselling and/or education (Hughes 1991; Chilmonczyk 1992; Davis 1992; Vineis 1993; Greenberg 1994; McIntosh 1994; Eriksen 1996; Irvine 1999; Groner 2000; Wilson 2001; Hovell 2002; Pulley 2002; Wakefield 2002; Zakarian 2004; Krieger 2005; Chan 2006a; Ralston 2008; Winickoff 2010; Butz 2011; Wilson 2011; Ralston 2013; Tyc 2013; Eakin 2014; Joseph 2014; Schuck 2014; Streja 2014; Yucel 2014; Walker 2015; Daly 2016).

Thirty-four of the 78 studies reported reduced children's ETS exposure among study participants regardless of assignment to intervention or control groups (Woodward 1987; Hughes 1991; Davis 1992; Vineis 1993; Elder 1996; Eriksen 1996; Severson 1997; Wahlgren 1997; Irvine 1999; Groner 2000; Ratner 2001; Wilson 2001; Hovell 2002; Wakefield 2002; Curry 2003; Fossum 2004; Abdullah 2005; Chan 2005; Krieger 2005; Chan 2006a; Kallio 2006; Nuesslein 2006; Ekerbicer 2007; Hovell 2009; Winickoff 2010; Halterman 2011; Herbert 2011; Wilson 2011; Chellini 2013; Prokhorov 2013; Ralston 2013; Tyc 2013; Eakin 2014; Nicholson 2015).

Household air quality

Eleven studies (N = 2636) reported household air nicotine measures (Wahlgren 1997; Emmons 2001; Hovell 2009; Borrelli 2010; Butz 2011; Stotts 2012; Prokhorov 2013; Eakin 2014; Streja 2014;

Kegler 2015; Borrelli 2016). Of these studies, two did not use air nicotine measures to evaluate the impact of interventions; Hovell 2009 used air nicotine measures to validate reported exposures, while Kegler 2015 used air nicotine measures to validate home smoking bans. Of the remaining nine studies, five (N = 1385) found a statistically significant benefit of the intervention in reducing air nicotine levels (Emmons 2001; Borrelli 2010; Prokhorov 2013; Eakin 2014; Borrelli 2016).

Borrelli 2010 reported a significant decrease in nicotine concentrations as measured by home monitors in the Behaviour Action Model (BAM) group (intervention to increase self-efficacy; baseline Mean = 1.07, standard error (SE) 0.19; three-month Mean = 0.28, SE 0.11; P = 0.01) but not in the Precaution Adoption Model (PAM) (motivational interviewing) group at three-month follow-up. Borrelli 2016 used the PAM for two aims: first, to determine whether second-hand smoke exposure (SHSe) feedback motivates cessation among parents of children with asthma versus parents of healthy children (HC) - the study reported significant differences in levels of SHS exposure detected by home monitors (PAM 92.1% vs HC 97.2%; P = 0.04), but not by child monitors (PAM 91.4% vs HC 95.6%); second, to evaluate whether greater intervention intensity (enhanced-precaution adoption model (PAM)) produces greater cessation than a previously tested intervention (PAM). However, data show no significant between-group differences.

Emmons 2001 used motivational interviewing and telephone counselling and reported reduced household air nicotine measurements over time in the intervention groups (kitchen and TV room air nicotine at six months (log-transformed units): intervention 3.7 and 3.1, falling to 2.6 and 2.3; Control 3.0 and 3.5, changing to 6.9 and 3.5; P < 0.05). As there was no change in the number of cigarettes smoked per day, nor in the cessation rate, the implication of the difference was that parents and carers had changed smoking location and had moved outside to smoke.

Eakin 2014 found that motivational interviewing and education resulted in significantly lower air nicotine levels compared to education alone (0.29 vs 0.40 mg) amongst carers of preschool children in a Head Start programme in the USA.

Prokhorov 2013 reported a significant decrease in nicotine concentrations for the intervention group, which received a comic book and "fotonovelas" for the "high-exposure" room (1.14 μg/m^3 to 0.20 μg/m^3; P < 0.01) but not for the "low-exposure" room, whilst the decrease noted in the control group was not significant. Of the four studies (N = 603) that did not show a significant benefit, three used counselling, motivational interviewing, or a combination of air cleaners and health coaching in ill-child settings (Wahlgren 1997; Butz 2011; Stotts 2012); while one used a combination of a video and a booklet with educational and risk reduction strategies, together with visual reminders, in a community setting (Streja 2014).

Child health outcomes

Sixteen studies (N = 12,520) assessed child health outcomes (Hughes 1991; Greenberg 1994; Armstrong 2000; Wilson 2001; Pulley 2002; Kimata 2004; Krieger 2005; Schonberger 2005; Wiggins 2005; Culp 2007; Borrelli 2010; Butz 2011; Halterman 2011; Wilson 2011; Hafkamp-de 2014; Walker 2015), and five studies measured child health outcomes, although they were not regarded as a primary outcome variable (N = 2184; see Analysis 1.1) (Wahlgren 1997; Cooper 2014; Abdullah 2015; Blaakman 2015; Borrelli 2016). Of these, the child health outcome of interest in 10 studies was asthma related (symptom scores, quality of life, functional morbidity, symptom-free days, and asthma-related health services utilisation). In three studies, the health outcome of interest was respiratory illness, and another two reported health service utilisation alone - community services in one, and hospital admissions and emergency visits in another. One study measured changes in neurotrophin levels but did not specify which neurotrophins were measured.

Nine studies found improvement in child health outcomes. Hughes 1991 (N = 95) embedded an intervention to reduce children's ETS exposure in a study of a comprehensive asthma education intervention. Although asthma control was improved there was no change in exposure to ETS. Greenberg 1994 (N = 933) targeted ETS exposure in infants younger than six months of age and aimed to reduce the incidence of lower respiratory tract illness and the prevalence of respiratory symptoms. For infants of smoking mothers, the study demonstrated a lower prevalence of persistent symptoms in the intervention group (17.8%) compared with the control group (30.9%; risk difference 13.1%; 95% confidence interval (CI) 1.0% to 27.0%). There was no difference in the incidence of illness. Wilson 2001 (N = 87) examined the effects of an intervention targeting smoking behaviour change and asthma education on healthcare utilisation and asthma hospitalisations, and explored other measures of asthma control. The study demonstrated a reduction in the prevalence of children making more than one acute care asthma visit in the year following the intervention. Given that there was no apparent benefit of the smoking-related counselling on smoking-related outcomes, it is likely that asthma education, rather than the smoking behaviour programme, achieved improvement in asthma morbidity. Kimata 2004 (N = 75) found that cessation of smoking had no effect on skin wheal responses nor on plasma neurotrophins among normal children, but achieved a significant reduction in skin wheal response, responses to house dust mite, and cat dander, along with lower neutrophil levels for those with atopic eczema/dermatitis syndrome. Neurotrophins are a subset of growth factors with a range of functions throughout the body and include nerve growth factor and brain-derived neurotrophic factor, as reported in Lackie 1999, which was the only study identified by this review to consider neurotrophin levels, and it does not specify which particular neurotrophins were measured. Krieger 2005 (N = 274) delivered a community home intervention to address conditions affecting

childhood asthma and reported that the high-intensity intervention group showed clinically significant improvement in paediatric carer asthma quality of life scores and a decline in urgent health service utilisation, but no significant difference in symptom-free days, compared to the low-intensity intervention group. However, they did not achieve a statistically significant intervention effect for carer reports of smoking in the home nor for reports of no smoking allowed in the home, so the child health intervention effect is probably due to other aspects of the intervention. Culp 2007 (N = 263) conducted home visits with the goal of promoting the health and development of first-time mothers and infants and found no significant differences between groups in terms of numbers of hospital admissions or emergency room visits. At 12 months, intervention mothers were more likely to make use of health department clinics for well-child care as compared to the control group (P = 0.04). Borrelli 2010 (N = 133) reported that the child's level of functional morbidity due to asthma decreased significantly (P < .001) in both the BAM (intervention to increase self-efficacy) and PAM (motivational interviewing) groups over time. Butz 2011 (N = 126) reported that after the two groups that used air cleaners were combined, children assigned to those groups showed a significant increase in symptom-free days during the previous two weeks: 1.36 compared with 0.24 symptom-free days for control group children from baseline to follow-up. Halterman 2011 (N = 530) used motivational interviewing to counsel the primary carer and an additional smoker who spent the most time with the child and observed inhaler administration at school by a nurse. This study only measured child health outcomes and found a significant improvement in many asthma-related outcome measures in the intervention compared to the control group. We have provided further details in the Analysis 1.1 table.

Seven studies (N = 9619) did not detect a significant intervention effect on child health outcomes (Wahlgren 1997; Armstrong 2000; Pulley 2002; Wiggins 2005; Wilson 2011; Hafkamp-de 2014; Walker 2015). See Analysis 1.1 for further details. Of these seven studies, three used complex interventions consisting of counselling and additional components (Wilson 2011; Hafkamp-de 2014; Walker 2015), two used complex interventions consisting of education and additional components (Armstrong 2000; Pulley 2002), one used in-person counselling (Wahlgren 1997), and one used community support groups for mothers (Wiggins 2005).

Schonberger 2005 (N = 476) reported associations of exposure to passive smoking with parentally reported asthma symptoms without group allocation. Therefore it is not possible to determine an intervention effect on child health outcomes.

Results according to child age

A smaller proportion of studies of infants detected beneficial intervention effects compared with studies of older age groups. Four (N = 1187) of the 23 studies that examined measures to reduce ETS exclusively among infants detected a beneficial intervention effect (Abdullah 2005; French 2007; Baheiraei 2011; Phillips 2012). Eight (N = 10,576) of the nine studies examining measures to reduce ETS among children up to and including preschool age demonstrated a beneficial intervention effect (Emmons 2001; Schonberger 2005; Harutyunyan 2013; Hafkamp-de 2014; Abdullah 2015; Collins 2015; Ortega 2015; Wang 2015). Ten (N = 22,078) of the 18 studies examining measures to reduce ETS among children up to and including school age and older demonstrated an intervention effect (Zhang 1993; Greenberg 1994; Wahlgren 1997; Kimata 2004; Krieger 2005; Yilmaz 2006; Borrelli 2010; Halterman 2011; Prokhorov 2013; Chen 2016).

Results according to setting

In the ill-child respiratory setting, four (N = 1028) of 13 studies demonstrated a beneficial intervention effect (Wahlgren 1997; Krieger 2005; Borrelli 2010; Halterman 2011). Krieger 2005 and Halterman 2011 showed a significant effect on child health outcomes but not on tobacco smoke exposure outcomes. Three of these four studies used intensive counselling or motivational interviewing, whilst one used a community home intervention with elements of education and behaviour change. Of the nine studies that did not demonstrate an intervention effect, three used intensive counselling, one used motivational interviewing, one used a motivational health coach in addition to air cleaners, two used brief counselling methods, and two used home visits.

In the ill-child non-respiratory setting, two (N = 119) of nine studies showed a beneficial intervention effect (Kimata 2004; Phillips 2012). Kimata 2004 did not describe the intervention, and Phillips 2012 used motivational interviewing for both groups, with the intervention group also receiving information about infant bonding. Of the seven studies that did not demonstrate an intervention effect, three used brief counselling methods and four used more intensive counselling, including one study that used motivational interviewing, one that used a booklet, and one that used cotinine feedback.

In the clinical setting (not designated well-child or ill-child), one study (N = 303) out of two demonstrated a beneficial intervention effect (Curry 2003). This study used a brief motivational message and a motivational interview, along with follow-up telephone counselling. Nuesslein 2006 (N = 40) did not find an intervention effect and used parental cotinine feedback.

In the clinical setting (both well-child and ill-child), Yilmaz 2006 (N = 3636) and Ortega 2015 (N = 1101) demonstrated a beneficial intervention effect. We included no other studies in this group.

In the well-child clinical setting, seven (N = 9866) of the 27 studies demonstrated a beneficial intervention effect (Armstrong 2000; Emmons 2001; Abdullah 2005; Schonberger 2005; French 2007; Baheiraei 2011; Hafkamp-de 2014). Three of these seven studies used motivational interviewing, two used home visiting interventions, one used telephone smoking cessation counselling, and one

used a combination of counselling and education. Of the 20 studies that did not demonstrate an intervention effect, five used brief counselling methods; five used intensive counselling methods; four used home visits; one used cotinine feedback; one used telephone counselling; one used nicotine replacement therapy; one used an information kit and letter; one used a combination of counselling, education, and feedback on exposure level; and another used a combination of feedback on a computer risk assessment and nurse brief advice.

In the community setting, eight (N = 20,975) of 21 studies showed a beneficial intervention effect (Zhang 1993; Harutyunyan 2013; Prokhorov 2013; Abdullah 2015; Blaakman 2015; Kegler 2015; Wang 2015; Chen 2016). Four of these eight studies used counselling, one of which used motivational interviewing; two used a combination of counselling, education, and feedback on exposure level; one was a school-based intervention; and one used a combination of telephone motivational interviewing and mailings. Of the 13 studies that did not demonstrate an intervention effect, two used telephone and two used in-person counselling; four provided a combination of counselling and education, smoking cessation brief advice, or feedback on cotinine exposure level; two provided a combination of education with a video and visual reminders or culturally tailored couples-based intervention with nicotine replacement therapy; one adopted a tobacco-free school policy; and one used a support health visitor intervention consisting of monthly supportive listening home visits.

Biological validation of parents' self-report

Of the 30 studies providing biological evidence of child ETS absorption, 16 (N = 4057) allowed an assessment of validation of parent-reported change in exposure versus child ETS absorption (Greenberg 1994; McIntosh 1994; Hovell 2000; Wilson 2001; Hovell 2002; Wakefield 2002; Kimata 2004; Zakarian 2004; Kallio 2006; Hovell 2009; Baheiraei 2011; Tyc 2013; Streja 2014; Walker 2015; Wang 2015; Daly 2016). Of these studies, seven (N = 2116) did not show a discrepancy between reported exposure and an objective measure of absorption (Wilson 2001; Wakefield 2002; Kimata 2004; Kallio 2006; Streja 2014; Walker 2015; Wang 2015). Kallio 2006 (N = 1062) reported that parent serum cotinine values showed that parents reported smoking habits accurately but did not provide data. Of the studies using environmental monitors of child exposure to ETS, Wahlgren 1997 (N = 91) and Hovell 2009 (N = 150) allowed an assessment of validation of parent-reported change in exposure versus objective measure. Wahlgren 1997 did not demonstrate a correlation between parental report and environmental monitoring, whilst Hovell 2009 reported a significant moderate correlation. For Hovell 2009, however, the results showed a significant reduction in child second-hand smoke exposure associated with the intervention according to reports, but not according to child urinary cotinine. Tyc 2013 (N = 135) also noted a significant decrease in reported child second-hand smoke exposure but not in child urinary cotinine in the intervention group. Borrelli 2010 (N = 133) noted that, according to monitors in the home, but not those on the child, there was a significantly greater reduction in exposure to children in the BAM (intervention to increase self-efficacy) group, although quit rates in the PAM (motivational interviewing) group were higher. This was thought to have occurred as the result of a greater change in the number of cigarettes smoked in front of the child in the BAM group, rather than following use of monitors as a validation measure.

Cost data and cost-effectiveness

Thirteen of the included studies made some reference to costs. However, this was generally limited to some statement of implementation costs. McIntosh 1994 (N = 92) mentioned the cost of the manual, and Severson 1997 (N = 1875) mentioned staff and intervention costs of the intervention per person. Conway 2004 (N = 143) and Wiggins 2005 (N = 731) also mentioned the costs of implementing the intervention but indicated that investigators did not conduct further analysis of cost-effectiveness because of a lack of an intervention effect. Krieger 2005 (N = 274) reported reduced urgent healthcare costs during the two months before the exit interview among those receiving the intervention relative to those in the comparison group, but investigators did not provide an extensive cost-benefit analysis. Cooper 2014 (N = 1050) reported total mean costs that were approximately £91 higher in the nicotine replacement therapy group and indicated that the incremental cost-effectiveness ratio (ICER) associated with nicotine replacement therapy use was £4926 per additional quitter (95% CI -£114128 to £126747).

ADDITIONAL SUMMARY OF FINDINGS *[Explanation]*

Interventions in the ill-child setting for reducing children's exposure to environmental tobacco smoke (ETS)				
Patient or population: people who smoke and are involved in the care of young children (birth to 12 years of age) **Settings:** healthcare - ill-child setting **Intervention:** behavioural interventions **Comparison:** usual care or minimal intervention				
Intervention type and outcomes[1]	**Impact**	**No. of participants**[2] **(studies)**	**Quality of the evidence (GRADE)**	**Comments**
Multi-component, counselling-based interventions assessed with biochemical validation of ETS exposure and self-report length of follow-up: 5 to 12 months	Three studies found no significant differences between intervention and control groups	746 (3 studies)	+--- VERY LOW[3]	
Multi-component, education-based interventions assessed with biochemical validation of ETS exposure and self-report length of follow-up: 6 to 13 months	One study reported significantly lower child's ETS exposure at home by any smoker at 12 months' follow-up (52% vs 58%; P = 0.03). Six studies found no significant differences between intervention and control groups	2936 (7 studies)	+--- VERY LOW[4]	
In-person counselling (no additional components) assessed with biochemical validation of ETS exposure, self-report length of follow-up: 3 to 18 months	Eight studies appeared to show intervention benefits based on self-reported ETS exposures but no significant differences between intervention and control groups in objective measures of exposure (e.g. cotinine)	1835 (8 studies)	+--- VERY LOW[5]	
Telephone counselling	No studies examined telephone counselling delivered in the ill-child setting and measured ETS exposure			

Brief interventions Assessed with presence of home and car smoking ban length of follow-up: 24 weeks	One study showed no significant differences between intervention and control groups in changed smoking policy: OR 2.0 (95% CI 0.166 to 24.069)	100 (1 study)	+--- VERY LOW[6]

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1] Not all studies reported length of follow-up; length given based on those that reported.
[2] Not all studies reported numbers of participants; number provided based on those that reported.
[3] Downgraded one level due to risk of bias: two studies at unclear risk of bias. Downgraded one level due to imprecision. Downgraded one level due to indirectness: all studies were set in the USA and cannot be generalised to low income countries where smoking is more prevalent.
[4] Downgraded two levels due to risk of bias: five of seven studies at high or unclear risk of bias. Downgraded one level due to inconsistency: interventions and populations were clinically heterogeneous.
[5] Downgraded two levels due to risk of bias: all eight studies at high or unclear risk of bias. Downgraded one level due to inconsistency: interventions and populations were clinically heterogeneous.
[6] Downgraded two levels due to risk of bias: only study was at high risk of bias. Downgraded one level due to imprecision: small study with a small number of events and wide confidence interval.

Interventions in the well-child setting for reducing children's exposure to environmental tobacco smoke (ETS)

Patient or population: people who smoke and are involved in the care of young children (birth to 12 years of age)
Settings: health care - well-child setting
Intervention: behavioural interventions
Comparison: usual care or minimal intervention

Intervention type and outcomes[1]	Impact	No. of participants[2] (studies)	Quality of the evidence (GRADE)	Comments
Multi-component, counselling-based interventions assessed with biochemical validation of ETS exposure, self-report length of follow-up: 2 to 12 months	One study found significant reduction in ETS exposure at home in the intervention group at age 6 years, but only on per-protocol analysis (OR 0.71, 95% CI 0.59 to 0.87). One study found an increase in smoking bans in the home (19.3%) and in the car (7%) after 8 weeks' follow-up in the intervention group, but not in the comparison group (2.5% increase in home ban and 0% change in car ban). One study found no significant difference between intervention and control groups in children's urinary cotinine levels	8005 (3 studies)	+--- VERY LOW[3]	
Multi-component, education-based interventions assessed with biochemical validation of ETS exposure, self-report length of follow-up: 2 to 12 months	One study found that maternal self-reported smoking at home around the infant was significantly less in the intervention group (8.6%) than in the control group (23.8%) ($P < 0.05$). Three studies found no evidence of effect of the intervention	1401 (4 studies)	++-- LOW[4]	

In-person counselling (no additional components) assessed with biochemical validation of ETS exposure, self-report length of follow-up: 3 to 90 months	One study found significantly greater reductions in geometric mean urinary cotinine in the intervention group (decrease from 48.72 ng/mg to 28.68 ng/mg) compared to the control group (decrease from 40.43 to 36.32 ng/mg). In addition, the intervention group had a significantly greater increase in the proportion of households with smoking bans at home (15%to 33.3%) compared to the control group (11.5% to 19.5%). One study found a significantly beneficial reduction in kitchen and TV room air nicotine levels in the intervention group than in the control group (P < 0. 05). One study found no difference in serum cotinine concentrations between the intervention and control groups	1483 (3 studies)	++-- LOW[5]
Telephone counselling assessed with self-report length of follow-up: 6 months	One study found a greater proportion with partial home smoking bans in the intervention group (62. 7%) than in the control group (56. 4%), as well as a higher biochemically validated quit rate for the intervention group (10.6%) than for the control group (4.5%) at 6 months	952 (1 study)	++-- LOW[6]
Brief interventions assessed with self-report length of follow-up: not specified	One study found no significant difference in home (OR 1.04, 95 CI 0.47 to 2.28) or car smoking bans (OR 1.47, 95 CI 0.69 to 3.11)	218 (1 study)	+--- VERY LOW[7]

	between intervention and control groups	

CI: confidence interval; OR: odds ratio

GRADE Working Group grades of evidence

High quality: Further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: We are very uncertain about the estimate.

[1] Not all studies reported length of follow-up; length given based on those that reported.

[2] Not all studies reported numbers of participants; number provided based on those that reported.

[3] Downgraded two levels due to risk of bias: all studies at unclear or high risk of bias. Downgraded one level due to inconsistency: interventions and populations were clinically heterogeneous.

[4] Downgraded one level due to risk of bias: one study was at high risk of bias. Downgraded one level due to inconsistency: interventions and populations were clinically heterogeneous.

[5] Downgraded one level due to risk of bias: two of three studies at unclear risk of bias. Downgraded one level due to inconsistency: interventions and populations were clinically heterogeneous.

[6] Downgraded one level due to risk of bias: included study at unclear risk of bias. Downgraded one level due to indirectness: ETS exposure was measured indirectly as reported smoking restrictions in home.

[7] Downgraded one level due to risk of bias: included study at unclear risk of bias. Downgraded one level due to indirectness: ETS exposure was measured indirectly as reported smoking restrictions in home and car. Downgraded one level due to imprecision: one study with a small number of participants and events.

DISCUSSION

Of the 78 included studies, a minority (26 studies) detected an effect in favour of the intervention, 24 of which reported statistically significant findings. Although the proportion of studies targeting the population or community level has increased since review authors conducted the previous update (Baxi 2014), most studies that detected an effect (15) were performed in clinical settings (eight well-child; five ill-child; two well- and ill-child), with eight successful interventions delivered in community settings and one in an unspecified setting. The intervention most frequently used in 16 of the 24 successful studies was counselling, two instances of which were provided in combination with education and feedback on measures of exposure. Seven of the eight studies in community settings used counselling successfully - five of the eight studies in well-child clinical settings, and three of the five studies in ill-child clinical settings.

However, counselling was also used in 29 of the 52 studies showing no effect of the intervention; most of which delivered the intervention in clinical settings (11 well-child; 9 ill-child), with nine delivering the intervention in community settings.

Our findings suggest that strategies that are effective in the adult healthcare setting may not be generalisable to the paediatric setting. Brief advice for adult smokers when they attend clinical services for their health has a positive effect in triggering quit attempts (Stead 2013). Trials of interventions for parents attending clinical paediatric or child health services did not detect this effect. However, this finding might suggest that either a different sort of brief intervention should be employed, or that this context should not be used for brief advice. Also, studies may have been underpowered to detect a small effect. Examination of the dynamics of the doctor-child-parent relationship may assist the development of brief strategies with a greater likelihood of success in this clinical setting. Given the unknowns about the doctor-child-parent interaction, interventions provided in this setting may potentially cause harm. One study reported a trend for mothers in the intervention group to smoke more than mothers in the control group after receiving the intervention (Irvine 1999). Several studies used only one-tailed t-tests to look for statistical significance. When an intervention may cause harm, even if the hypothesis is unidirectional, investigators should always employ two-tailed tests of significance. Hovell 2009 undertook a regression analysis to examine factors associated with the longest participant smoking quit attempts following counselling. The odds favouring the longest quit attempt were significantly increased when participants had made a 24-hour quit attempt in the year prior to baseline, had tried a greater number of methods to quit in the past, and had reduced permissiveness of home smoking. Researchers did not find significant associations between longer quit attempts and level of education, heaviness of smoking or the smoking status of a partner.

There are relatively high rates of smoking cessation in pregnancy, both spontaneously and with clinical interventions (Chamberlain 2017; Coleman 2015). With high postnatal relapse rates reported among women who have quit during pregnancy (Lelong 2001), prevention of relapse for this group is an obvious means of preventing environmental tobacco smoke (ETS) exposure for their children. Ratner 2001 and Van't Hof 2000 identified risk factors for relapse. Risk factors identified by Ratner 2001 included having a partner who smoked and smoking a greater number of sticks per day before quitting; data show that prolonged breast feeding and higher scores on a scale measuring mental health were protective. Van't Hof 2000 found that a lower level of confidence in maintaining cessation, a lower level of encouragement by family and friends to maintain cessation, and greater numbers of family and friends who smoked were all associated with significantly higher odds of postpartum relapse. Further work in this area will make an important contribution.

Many of the studies identified for this review demonstrated reduced child exposure to ETS among participants, regardless of assignment to intervention or control groups, which suggests that studies may be describing the natural history of smoking among parents. Parents may reduce their own smoking or their children's exposure over time, possibly as a result of social pressures. Indeed the prevalent social trend in many developed countries over the past decade has been increased community concern about exposing non-smokers to ETS (although arguably more so among non-smokers than among active smokers). This is especially true for adults in the workplace and in public spaces such as bars and restaurants, particularly in North America, Australia, and some countries within the EU, where total smoking bans for these settings are increasingly legislated. Campaigns and community concerns about children's exposure to ETS at home and in cars have also increased. It is possible that these studies have recorded parents responding to this social trend by limiting their children's exposure in the home. This being the case, studies need to aim not just for a reduction in children's ETS exposure, but for a greater than background reduction in ETS exposure. For a study to produce a significant effect, the impact of interventions must be greater than the rate of decline in comparison groups. It may be true that as most studies used comparison groups rather than control groups (i.e. no cessation or avoidance advice and no information), the comparison interventions may have been more effective than anticipated. As studies have generally involved comparison groups receiving a limited intervention rather than strict control groups, this is certainly possible. Moreover, measurement of tobacco smoke exposure outcomes alone may produce an intervention effect and thus may be an important component of any intervention.

We judged the inconclusive evidence presented in this review to be of low or very low quality, despite the fact that this review includes 78 studies (Summary of findings for the main comparison; Summary of findings 2; Summary of findings 3). Limitations include risk of bias, heterogeneity among study interventions and populations, and small sample sizes with low statistical power.

Continuing to perform studies without adequate sample size, quality, or comparable interventions and populations will not allow for any conclusions to be reached regarding the clinical effects or cost-effectiveness of interventions. Moreover, additional low-quality studies may be an unethical use of resources and participants' time.

Limitations of methods employed

The heterogeneity of study designs and characteristics rendered quantitative analysis inappropriate for this review. However, there is currently no best approach in narrative, rather than quantitative, syntheses of published studies. As we have included 78 studies, it would not be feasible to list results of each in the main text. Therefore, we have highlighted key results in our narrative summary and have recorded further results data in Analysis 1.1. However, we are aware that in some places, this means that studies with statistically significant results have been described in greater detail in the text than those that did not detect an effect. We have attempted to mitigate any impact of this by explicitly describing studies that tested similar interventions but did not detect an effect.

An additional limitation is that, of the 20 studies that used objective measures of children's ETS exposure or absorption, only four showed no discrepancy between parental reports of children's exposure and the biological measures. As most studies did not use objective measures, this calls into question the validity of self-reported data provided in this review.

As noted above, many of the included studies had small sample sizes, and fewer than half (N = 28) reported a power calculation. For studies that did not detect an effect, this makes it difficult to establish whether the intervention was genuinely not effective, or if a result was not detected because the sample size was too small.

Included studies reported varying lengths of follow-up. We used the longest reported follow-up for the results. However, some studies reported short lengths of follow-up, with 20 studies reporting follow-up of less than six months. It is difficult to determine the sustainability and long-term effectiveness of interventions when study follow-up is short. Indeed, of the studies reporting longer follow-up, some did show an initial difference between intervention and control groups that was not sustained at the final follow-up period.

Finally, given that the burden of ETS is shifting more and more towards low- and middle-income countries, and that in high-income countries the burden is disproportionately falling on disadvantaged households, findings of the studies included in this review may not be generalisable, as these trials were conducted mainly in high-income countries.

AUTHORS' CONCLUSIONS

Implications for practice

- There is currently insufficient evidence to support one strategy over another to reduce the prevalence or level of children's environmental tobacco smoke exposure.
- There is no clear evidence of difference in levels of success between different settings, including well-child, ill-child and community contexts.
- There is limited support for the delivery of more intensive counselling interventions to parent(s).

Implications for research

- Given the potential for bias in parental reports of children's environmental tobacco smoke (ETS) exposure, future studies should use biochemical verification of children's exposure to or absorption of ETS.
- Studies with larger sample sizes are needed to adequately explore the effects of family and carer interventions in reducing children's exposure to ETS.
- Studies should be designed and powered with consideration of the reduction in children's ETS exposure that occurs in comparison groups and in the wider community.
- Studies should minimise risk of bias, whilst providing detailed descriptions of methods used during randomisation and allocation concealment.
- Researchers should provide detailed descriptions of interventions to aid reproducibility.
- More studies are required to assess the impact of identical interventions to ascertain quantitative effect estimates.
- Study reports must mention costs.
- Further underpowered and/or low-quality studies are unlikely to enhance understanding in this field.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Abdullah 2005

Methods	Country: Hong Kong, China Setting: community (maternal and child health centres) Type: RCT
Participants	952 parents from a birth cohort who were listed as smokers in the '1997 Birth Cohort Study' of the Department of Community Medicine, University of Hong Kong
Interventions	Intervention: 20 to 30 minutes of telephone counselling with information based on individual needs; no NRT information given unless asked, and even then, information given was kept minimal. Stage-based printed self-help materials (based on baseline) provided just once. Control: Recieved stage-based printed self-help material only.
Outcomes	At 6 months: • Parental quitting: self-reported 7-day prevalence quit rate, self-reported 24-hour point prevalence quit rate, self-reported continuous abstinence rate, biochemically validated (CO or urine cotinine or both) quit rate, reported implementation of total or partial smoking ban at home
Type of intervention	Well-child (child health check)
Notes	Retention: 837/952

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomised; method not described
Allocation concealment (selection bias)	Low risk	Numbered sealed opaque envelopes
Incomplete outcome data (attrition bias) All outcomes	Low risk	Losses to follow-up 11% intervention/4% control. Included as continuing smokers
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"Independent interviewer...was unaware of subjects' group allocation... All respondents who reported they were not smoking during the preceding 7 days were invited to attend the research centre for biochemical validation."

Abdullah 2015

Methods	Country: Shanghai, China Setting: community (households) Type: RCT
Participants	318 households with smoking parents or caregivers who had children aged 5 years or younger at home
Interventions	Intervention: • Counselling, conceptualised on the basis of the protection motivation theory developed by Rogers 1975 • Smoking hygiene intervention (SHI) with brief advice to quit SHI: • Keeping child away from household members' and other people's smoke • Avoiding smoking in the car or in closed areas near the child • Not taking the child into smoky environments • Enforcing a strict no-smoking policy at home and in the car Control: • Placebo intervention included counselling on child development issues • No SHI or second-hand smoke (SHS) exposure reduction or quit smoking counselling provided by the study counsellor. When queries on smoking or SHS were raised by participants, they were given the hotline number of the Shanghai CDC's smoking cessation clinic
Outcomes	Child exposure: Primary outcomes at 6 months: • Participant-reported improvement in smoking hygiene in the household (smoking restriction by household members at home) • Reduced exposure of child to SHS inside the home measured by mean number of cigarettes per week • Reduction in children's urine cotinine concentrations Secondary outcomes: • Total SHS exposure to child from all smokers inside and outside the home • Household members smoking cigarettes around the child • Smoking behaviour of household members (reducing the mean number of cigarettes smoked daily, making a quit smoking attempt for at least 24 hours, and quitting smoking) Child illness: Respiratory illness incidence among children as reported by key household members Target behaviour change: Secondary outcome at 6 months: • Smoking behaviour of household members (reducing mean number of cigarettes smoked daily, making a quit smoking attempt for at least 24 hours, and quitting smoking). Verified by CO measure
Type of intervention	Community-based
Notes	Conflict of interest: none declared Source of funding: Flight Attendant Medical Research Institute (FAMRI), USA, grant 072233_CIA; and American Academy of Pediatrics, Julius B. Richmond Center of Excellence

Abdullah 2015 (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random numbers were computer-generated by the project manager (not counsellors) before participant recruitment
Allocation concealment (selection bias)	Low risk	Counsellor opened a serially numbered, opaque, and sealed envelope to reveal the random assignment of each smoker to intervention or control group
Incomplete outcome data (attrition bias) All outcomes	High risk	Large dropout rate; more than 40% of the households in each group were not available. This was the result of many households relocating to a new residential area, farther from the original study area. Analysis does not appear to be intention-to-treat
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Not blinded but objective measure (cotinine)
Other bias	High risk	In addition to dropout rate: • Small possibility of cross-contamination between intervention and comparison groups • Dosing (i.e. contact duration and frequency) of the intervention was not equal for the intervention and comparison groups • Social desirability bias due to interview format

Armstrong 2000

Methods	Country: Australia Setting: community (child health nurse home visits) Type: RCT
Participants	181 women recruited from a postnatal ward who had given birth to a single live infant, identified as 'at risk' (1 or more of identified physical domestic violence, identified childhood abuse by either parent, sole parenthood, or ambivalence to pregnancy; as well as 3 or more of maternal age < 18 years, unstable housing, financial stress, poor maternal education, low family income, social isolation, history of mental health disorder, drug or alcohol abuse, and domestic violence other than physical abuse)

Armstrong 2000 (*Continued*)

Interventions	Intervention: • Home-based intervention focused on establishing trust with families, enhancing parenting self-esteem and confidence, providing guidance for child development including crying and sleep behaviour, promoting preventive child health care and facilitating access to child health centres • Weekly home nurse visits for first 6 weeks, fortnightly for 3 months, then monthly until 6 months postpartum Control: • Usual care
Outcomes	At 4 months: • Health outcomes only reported at 12 months • Maternal self-report of smoking behaviour and observations by research assistants of smoking behaviour in the home • Child health questionnaire
Type of intervention	Well-child (peripartum)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"A random number table was computer generated."
Allocation concealment (selection bias)	Low risk	The random number table was "used by a clerical officer not involved in determining eligibility to determine intervention status"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Similar rates of retention at 12 months in both arms (76% intervention, 77% control)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"Data were collected in the home by a researcher who was naive to the intervention status of the participants and was not involved in providing healthcare to the participants."

Baheiraei 2011

Methods	Country: Iran Setting: recruited from health centres, intervention face-to-face/on phone RCT
Participants	130 families with healthy infants younger than 12 months
Interventions	Intervention: • Counselling (motivational interviewing) of mothers and fathers Control: • Usual care (health visits for checking infant's growth and developmental milestones) • Parents given a pamphlet and sticker depicting a smoke-free home
Outcomes	Infant urinary cotinine at baseline and at 3 months Change in parental smoking Home and car smoking bans
Type of intervention	Well-child (child health check)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided
Allocation concealment (selection bias)	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	4/65 lost to follow up in control group and 5/65 in intervention group
Blinding of outcome assessment (detection bias) All outcomes	Low risk	The statistical analyst and outcome assessors were blinded to the group assignment, the control group was uninformed of the counselling processes

Blaakman 2015

Methods	Country: USA Setting: community (home) Type: RCT
Participants	165 caregivers and their infants born at ≤ 32 weeks' gestational age, within 6 weeks of discharge from the NICU

Blaakman 2015 (*Continued*)

Interventions	Intervention: • Counselling provided by 1 of 2 research nurses trained in motivational interviewing and actively supervised by an expert in the field • Sessions included smoking cessation or relapse prevention counselling for willing caregivers who were current or former smokers, while second-hand smoke exposure control efforts were explored and reinforced for all • Motivational interviewing technique used: elicit-provide-elicit • Trialists also offered information on resources (e.g. smokers quit line, pharmacotherapy) Control: • Brief asthma education at baseline only
Outcomes	Child exposure: • Postintervention infant exposure to second-hand smoke assessed via caregiver-reported data from survey that occurred closest to completion of the intervention (5-month survey) • Salivary cotinine samples obtained at study end (8 months after NICU discharge) used as an objective measure of infant SHS exposure Child illness: • Respiratory symptoms assessed by asking caregivers to quantify in the past 2 weeks number of days with wheeze/cough, number of nights awakened because of wheeze/cough, number of days having taken rescue medication, and number of symptom-free days Child health service utilisation: • Asked caregiver about numbers of visits to primary care provider and emergency department, and hospitalisations for wheezing or breathing problems since the prior survey Target behaviour change: • Smoking ban in home/car, caregiver confidence, and motivation to quit smoking
Type of intervention	Community-based
Notes	Conflict of interest: none declared Source of funding: grant from the Halcyon Hill Foundation (Halterman, PI), which had no involvement in submission of this manuscript for publication

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Method not specified
Allocation concealment (selection bias)	Low risk	Concealed envelope system, stratified by caregiver-reported routine infant SHS exposure
Incomplete outcome data (attrition bias) All outcomes	Low risk	12.7% of participants dropped out (18.1% in the treatment group vs 7.3% in comparison group)

Blaakman 2015 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Assessments were completed by study team members blinded to the infants' randomisation category. Objective measure also used (cotinine)

Borrelli 2010

Methods	Country: USA Setting: recruited from various sites including hospital in-patient settings and clinics, Latino cultural events. Intervention involved counselling visits and phone calls Type: RCT
Participants	Latino caregivers who smoked and had a child with asthma
Interventions	Group 1: Behavioral action model (BAM). This was modelled on clinical guidelines for smoking cessation. The model focused on increasing the smoker's self-efficacy to quit by teaching problem solving and coping skills Group 2: Precaution adoption model (PAM). This model used feedback on the caregiver's carbon monoxide level and the child's second-hand smoke exposure, using motivational interviewing techniques Eight weeks of transdermal nicotine patches were available free of charge if participants were ready to quit
Outcomes	Passive nicotine monitors at baseline and at 3 months after completion of treatment Level of functional morbidity due to asthma Smoking cessation by caregiver; self-report and expired air CO concentration (continuous abstinence, 7-day point prevalence abstinence)
Type of intervention	Child with health problems (respiratory disorders)
Notes	Attrition 37/133

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Randomised by computer-generated sequence
Allocation concealment (selection bias)	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition 37/133
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Self-report assessments administered by research assistants blinded to the treatment condition

Borrelli 2010 (*Continued*)

Other bias	High risk	Selection bias. Some participants were enrolled from other studies, so it may be difficult to elicit study-specific effects. Inconsistencies in presentation of data: BAM group (n = 68) had results for n = 49 at the end of the study, and not all were accounted for. Similarly in the PAM group, n = 65 and completed n = 49 at end of treatment, and not all were accounted for. Outcomes presented for 'acculturation' and 'asthma morbidity', but no details on how these were assessed

Borrelli 2016

Methods	Country: USA Setting: community (home and telephone) Type: RCT
Participants	560 smoking primary caregivers (parents) of both children with asthma and healthy children
Interventions	• Precaution adoption model intervention (PAM; motivational interviewing to deliver feedback on child's second-hand smoke (SHS) exposure and smokers' carbon monoxide levels and cessation induction strategies) • Home visit (for aim 1/teachable moment): Parents of children with asthma received NIH guideline-based asthma education, while parents of healthy children received child wellness counselling. All participants received identical smoking cessation counselling via motivational interviewing. Verbal and graphical feedback was provided regarding smoking level, carbon monoxide level, how quitting could reduce disease risk and symptoms, the child's SHS exposure, risk of smoking on the child's SHS exposure, and how risks could be reduced by quitting smoking or reducing SHS exposure • Telephone counselling (for aim 2/intervention intensity): Both PAM and enhanced PAM received six 15- to 20-minute calls regarding asthma symptoms and management for 4 months after the home visits. Enhanced PAM also received smoking cessation and a second round of SHS exposure feedback
Outcomes	Child exposure: 2 passive nicotine monitors (dosimetry) placed for 1 week during each of the 2 measurement periods (baseline and after call 5) - 1 in the room where the child spends the most time and 1 worn by the child. Parent-reported SHS exposure assessed by structured interview Child illness: asthma morbidity (numbers of asthma-related hospitalisations, school days missed due to asthma, days with asthma symptoms, and Asthma Functional Morbidity Scale scores) Child health service utilisation: asthma-related hospitalisations Target behaviour change: proportion of participants who quit; verified by expired air carbon monoxide testing at all follow-up intervals

Borrelli 2016 (*Continued*)

Type of intervention	Child with health problems (respiratory disorders)	
Notes	Conflict of interest: none declared Source of funding: NIH grant R01 HL062165-06	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Urn randomisation (form of adaptive biased-coin randomisation)
Allocation concealment (selection bias)	Low risk	Allocation sequence could not be accessed by staff.
Incomplete outcome data (attrition bias) All outcomes	High risk	Although no significant difference was seen in the counselling call completion rate, this rate was only 55% by 12-month follow-up
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Objective measure used - air nicotine
Other bias	High risk	• At baseline, comparison group (healthy children) was significantly different from the 2 intervention groups (PAM and enhanced PAM) with respect to child and parent age, cigarettes smoked per day, years smoked, nicotine dependence, and % household smoking ban. Note that randomisation only occurred for the 2 intervention arms • Potential detection bias in that the half-life of carbon monoxide is 4 to 6 hours, and so 7- and 30-day point prevalence abstinence cannot be verified beyond that time frame

Butz 2011

Methods	Country: USA Settings: hospital and home RCT (3 arms)
Participants	Inner city families with a child aged 6 to 12 years with asthma, residing with a smoker

Butz 2011 (*Continued*)

Interventions	Health coach/air clear group: two air cleaners and four 30- to 45-minute nurse health coach home visits, and a behavioural intervention to reduce child second-hand smoke exposure Air cleaner group: two air cleaners and 4 asthma education sessions Control group: asthma education during 4 nurse home visits
Outcomes	Six-month follow-up from baseline: • Child urinary cotinine at baseline and at 6-month follow-up • Asthma symptom-free days • Acute asthma healthcare events • Change in air quality • Caregiver smoking frequency and location
Type of intervention	Child with health problems (respiratory disorders)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Randomised in 1:1:1 ratio with random block sizes; randomisation performed by study co-ordinator using the function in the database
Allocation concealment (selection bias)	Low risk	All study staff, including all investigators, were blinded to subsequent group assignment
Incomplete outcome data (attrition bias) All outcomes	Low risk	91.3% followed up
Blinding of outcome assessment (detection bias) All outcomes	Low risk	All study staff, including all investigators, were blinded to subsequent group assignment
Other bias	High risk	Children randomised to the control group had caregivers who smoked significantly more at baseline and follow-up than those in either intervention group

Chan 2005

Methods	Country: Hong Kong, China Setting: hospital (paediatric wards/outpatient settings) Type: RCT
Participants	80 parents of sick children presenting to a clinic or admitted to a children's ward of a major Hong Kong hospital
Interventions	Intervention: individualised motivational intervention for 30 minutes with nurse counsellor; appropriate stage-matched intervention used to "increase motivation and lower resistance to quit"; telephone reminder 1 week after the intervention Control: healthy diet counselling for their sick children as a placebo intervention
Outcomes	One-month follow-up: • Parent report of daily cigarette consumption in past 30 days
Type of intervention	Child with health problems (ill-child health care)
Notes	Retention: 77/80

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	"Randomized controlled trial"; no further information provided
Allocation concealment (selection bias)	Unclear risk	Randomised after completion of questionnaire; no further information provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low loss to follow-up: 77 (of 80) participants followed-up successfully
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	"At 1 month, trained interviewers who were blinded to the group assignment delivered telephone follow-up calls to both groups to evaluate the primary and secondary outcomes using a standardized questionnaire." Self-reported outcome only; bias possible

Chan 2006a

Methods	Country: Hong Kong, China Setting: hospital (paediatric wards and outpatient departments) RCT
Participants	1483 mothers of sick children admitted to the ward or attending the outpatient department from all participating trial centres, November 1997 to September 1998

Chan 2006a (*Continued*)

Interventions	Intervention: Mothers received information from nurses including standardised health advice, booklet about preventing child exposure to passive smoking, booklet to give to fathers on quitting smoking, a no smoking sign to place in the home to remind the father not to smoke, and a telephone reminder 1 week later. Control: normal care by nurses
Outcomes	3-, 6-, and 12-month follow-up: • Mother self-reports actions taken to reduce child passive smoke exposure
Type of intervention	Child with health problems (ill-child health care)
Notes	Retention: 1273/1483 (86%)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Random numbers were generated by the investigator using the computer and assigned to intervention (even) and control (odd) groups."
Allocation concealment (selection bias)	Low risk	"Nurses then randomized the subjects into the intervention or control group by opening a sealed envelope with serial numbers."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low loss to follow-up, ITT analysis used, similar percentage lost in both groups: 86% intervention and 85% control retention
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Self-report only; differential misreport possible, but no difference found between groups, so unlikely
Other bias	High risk	Contamination of the control group possible: open ward setting "...the mothers in the control group could have by chance read the health education booklet from the mothers in the intervention group... furthermore, the nurses' health education could be easily overheard."

Chellini 2013

Methods	Country: Italy Setting: well-child, in the community RCT
Participants	218 women 30 to 49 years of age with children
Interventions	Brief counselling and 3 gifts. Both groups received self-help booklet
Outcomes	Reported smoking restrictions in home and car Change in smoking status reported
Type of intervention	Well-child (child health check)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Random number table used
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Low risk	12 of 218 lost to follow-up and ITT analysis performed
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not discussed for observer; objective measure not used

Chen 2016

Methods	Country: Taiwan Setting: community (schools) Type: RCT
Participants	75 parent and child dyads in 6 elementary schools (grades 3 to 6); school was the unit of assignment
Interventions	Intervention: Parent-child dyads received an interactive programme comprising 3 weekly group sessions and 1 individual telephone counselling session 4 weeks after group sessions Control: Written materials related to tobacco information were received by mail 4 times during the same time period instead of the intervention sessions
Outcomes	Child exposure: urine cotinine as well as parent and child reports of children's exposure to parental smoking Target knowledge change: Aims of intervention were to instil knowledge regarding the

Chen 2016 (*Continued*)

	mechanism of the harmful effect of ETS, to correct people's perceptions of the smoking patterns that lead to ETS exposure at home, to introduce strategies for reducing ETS, and to assist parent-child dyads in formulating strategies for maintaining a smoke-free home
Type of intervention	Community-based
Notes	Conflict of interest: none declared Source of funding: National Science Council of Taiwan (NSC97-2314-B-038-043-MY3)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not stated
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Low risk	21% dropout rate
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Single-blind; objective measure (cotinine)
Other bias	High risk	Selection bias: differences in participation rates between intervention and control groups. Non-simultaneous collection of self-reported data and urine cotinine levels during post-test 2 may have caused inconsistency in the data

Chilmonczyk 1992

Methods	Country: USA Setting: well baby check RCT
Participants	103 mothers smoking ≥ 10 cigarettes/d with infants presenting to a well baby check
Interventions	Urine was collected from all infants and analysed for cotinine. Intervention: A report of the infant's urinary cotinine level along with a personalised letter to the mother to be signed was returned to the child's doctor. The letter outlined ways to reduce child ETS exposure (identify location of smoking, wash hands after smoking, ensure day care home is smoke-free, ask friends to avoid smoking in the presence of the infant when visiting) but did not discuss cessation. The physician called the mother by

Chilmonczyk 1992 (*Continued*)

	telephone to further explain the results. Control: usual care
Outcomes	At 2 months, all participants were contacted to obtain a second urine sample from the infant for analysis
Type of intervention	Well-child (child health check)
Notes	Retention: 56/103 (54%)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"randomly assigned by computer on an individual basis to intervention or control groups"
Allocation concealment (selection bias)	Low risk	See above.
Incomplete outcome data (attrition bias) All outcomes	Low risk	High loss to follow up - 43% control and 48% intervention; "however, it is unlikely that exclusion bias would mask a true impact of the intervention. Characteristics of those who complied were similar to those of the noncompliers... even with the reduced participation... the data were adequate to indicate that the response to the intervention was poor"
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Outcomes biochemically verified

Collins 2015

Methods	Country: USA Setting: community (home and telephone) Type: RCT
Participants	300 underserved smoking mothers of tobacco-exposed infants and preschoolers
Interventions	Intervention: Behavioural counselling included 2 in-home and 7 telephone sessions within 16 weeks. Home sessions aimed to offer skills training and modelled support for tobacco smoke exposure reduction efforts. Mothers also received 4 sections of written self-help materials mailed at 2-week intervals to supplement counselling content Control: Participants mailed a single binder of written materials within a week of enrolment. Content was identical to the intervention group's 4 separate mailings. During

Collins 2015 (*Continued*)

	telephone confirmation of receipt, staff provided a 5- to 10-minute programme overview of the binder with brief advice and encouraged mothers to share materials with the family
Outcomes	Child exposure: maternal report and child urine cotinine Target behavioural change: biological (maternal saliva cotinine) to verify self-reported smoking status, reported cigarettes smoked per day, reported tobacco smoke exposure, reported presence of other smokers in home, and total smoking ban in home
Type of intervention	Community-based
Notes	Conflict of interest: none declared Source of funding: National Cancer Institute at the NIH (CA105183 and CA93756)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Block randomisation via small blocks of random length, stratified by child race, gender, and recruitment site. Method not specified
Allocation concealment (selection bias)	Unclear risk	After baseline completion, the intervention manager obtained group assignment via a secured Internet interface. Unclear whether this was concealed
Incomplete outcome data (attrition bias) All outcomes	Low risk	Control group: 3% of allocated did not initiate control intervention, and a further 17% were lost to follow-up Intervention group: 11% of allocated did not initiate treatment, and a further 19% were lost to follow-up
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Single-blind and objective measure (cotinine)

Conway 2004

Methods	Country: USA Setting: community RCT
Participants	143 Latino parents of children aged 1 to 9 who reported smoking at least 6 cigarettes a week

Conway 2004 (*Continued*)

Interventions	Intervention: 6 home and telephone sessions over a 4-month period delivered by lay trained bicultural and bilingual Latina community health workers. Focused on problem solving aimed at lowering target child's exposure to ETS in the household. Intervention methods included contracting, shaping, positive reinforcement, problem solving, and social support to assist families in achieving their ETS goals. Control: survey completion only
Outcomes	3-Month and 12-month follow-up: • Child hair nicotine and cotinine • Parent report of child's past month exposure from all sources in the household over previous 30 days as measured by numbers of cigarettes • Confirmed reduction based on both parents' reports and children's hair biomarkers
Type of intervention	Community-based
Notes	Retention: 127/143 (89%)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	"randomized"; no further details given
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Low risk	81% provided data at all assessments, "and analyses showed attrition introduced no significant biases"
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used

Cooper 2014

Methods	Country: UK Setting: hospital (antenatal clinic) Type: RCT
Participants	1051 smoking 12- to 24-week pregnant women who currently smoke 5 or more cigarettes per day and who smoked at least 10 cigarettes per day before pregnancy
Interventions	Intervention: biochemically validated smoking cessation with transdermal nicotine patches (15 mg per 16 hours) for 4 weeks, followed by another 4 weeks if abstinent Control: visually identical placebo

Cooper 2014 (*Continued*)

Outcomes	Child exposure: maternal self-reported prolonged and total abstinence from smoking validated by exhaled CO and/or salivary cotinine Child illness: birth outcomes, infant impairment, infant respiratory symptoms up to age 2 Target behavioural change: smoking cessation
Type of intervention	Well-child (antenatal health check)
Notes	Conflict of interest: NM reports personal fees from Novartis and personal fees from Elsevier, outside of the submitted work; TC reports personal fees from Pierre Fabre Laboratories, France, outside the submitted work Source of funding: HTA programme project number 06/07/016

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Internet-based randomisation that was stratified by recruiting site
Allocation concealment (selection bias)	Unclear risk	All pharmacists, research staff, and trial participants blinded to treatment allocations, but unclear about allocation concealment
Incomplete outcome data (attrition bias) All outcomes	Low risk	By 2-year follow-up, 14% in NRT group and 15% in control group dropped out
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Double-blind and objective measure
Other bias	High risk	• Smoking data were not sought from all participants at predetermined time points, but were obtained opportunistically at multiple, different times between 8 and 54 months after childbirth, rendering smoking behaviour data difficult to interpret • Smoking outcomes at 2 years were self-reported, which may lead to bias; furthermore, these outcomes were not assessed in about 40% of participants

Culp 2007

Methods	Country: USA Setting: home Quasi-experimental controlled study
Participants	Pregnant women in rural counties (first-time mothers) with follow-up until the child was 12 months old
Interventions	Intervention: home visits with the goal of promoting the health and development of first-time mothers and infants (The Community-Based Family Resource and Support (CBFRS) Program). The programme had 3 main foci: maternal health, child health and safety, and family functioning and parenting. Child's exposure to ETS was 1 part of this intervention Control: received standard health department services that did not include home visits
Outcomes	Mother's reported number of cigarettes smoked per day at baseline, and when infant was aged 6 and 12 months Numbers of hospital admissions and emergency room visits, and visiting health department clinics for well-child care Knowledge: Mother asked 6 questions (a set) about the effect of smoking on her child's growth and development
Type of intervention	Well-child (peripartum)
Notes	Part of a wider intervention federally funded programme, which also included several interventions unrelated to ETS

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not applicable
Allocation concealment (selection bias)	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	High risk	Overall dropout from analysis rate was fairly low (26%), but dropout rate was higher in the control group (dropout 49/205 intervention group, 43/150 in control group). Characteristics of dropouts as a whole are described. No intention-to-treat analysis was carried out. Under these circumstances, attrition bias is certainly possible
Blinding of outcome assessment (detection bias) All outcomes	High risk	Outcomes were assessed at interview by research staff, who were independent of the intervention staff. However, outcome assessors could very likely have been aware of

Culp 2007 (*Continued*)

		which groups participants were in, as this was decided geographically, and blinding is not mentioned. The paper found a positive intervention effect
Other bias	High risk	Not an RCT, so very open to selection bias - significant difference in number of years of education between groups. Not much baseline questionnaire info provided, so unclear whether e.g. knowledge re smoking differed from the start between the 2 groups

Curry 2003

Methods	Country: USA Setting: paediatric clinics serving ethnically diverse population of low-income families RCT
Participants	303 self-identified women smokers whose children received care at participating clinics
Interventions	Intervention: During clinic visit, women received brief motivational message from the child's clinician, a guide to quitting smoking, and a 10-minute interview with a nurse or study interventionist. Women also received as many as 3 outreach telephone counselling calls from the clinic nurse or interventionist in the 3 months following the visit. Control: usual care
Outcomes	3-Month and 12-month follow-up: • Maternal self-reported 7-day abstinence • Maternal CO testing
Type of intervention	Mixed/not stated
Notes	Retention: 81% at 12 months

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Participants "determined their randomization group by choosing a Ping-Pong ball out of a brown paper bag. The bag contained several Ping-Pong balls that were either white or yellow, and the color of the selected ball indicated their study group"
Allocation concealment (selection bias)	High risk	See above.

Curry 2003 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	Low risk	19% lost at final follow-up; counted as smokers. Similar numbers lost to follow-up in both groups
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used in subset: "We determined the comparability of compliance with testing between the intervention and control groups and then examined the effect on self-reported rates of abstinence of adjusting outcomes by the percentage of abstainers who tested above the cut-off point."

Daly 2016

Methods	Country: Australia Setting: community well-child health clinic Type: RCT
Participants	1424 parents of children aged 0 to 4 years attending well-child health checks
Interventions	Interventions: Arm 1: • Computer-delivered care - tailored on-screen information and a printed self-help report regarding the risks of infant SHS exposure, how to reduce exposure risk, advice on quitting smoking, and contact details of the free quit line • Child health nurse-delivered care - During the subsequent clinic consultation, nurses provided a brief intervention focussing on risk reduction for the infant and offering NRT to parents/carers who were smokers. Contact details of the quit line were again provided, and nurses discussed the importance of complete home smoking bans, providing advice to address any barriers to their implementation Arm 2: • Same as above, plus infant urine cotinine measured and results shared with parent, child health nurse, and their GP. A guide to preventing infant SHS exposure and strategies for quitting smoking were also included Control: • Usual care from child health nurses
Outcomes	Child exposure: Primary outcome: Parent/carer reported infant exposure to SHS, defined as a person smoking in the infant's presence in the past 3 days. At 12-month follow-up, if parent/caregiver reported the infant as NOT exposed, this was validated with urine cotinine test Secondary outcomes: parent/caregiver smoking status and household smoking ban status of the home Target behavioural change: proportion who quit and proportion with complete household smoking ban
Type of intervention	Well-child (child health check)

Daly 2016 (*Continued*)

Notes	Conflict of interest: unclear Source of funding: Financial Markets Foundation for Children, Community Health and Anti Tuberculosis Association, Centre for Health Research & Psycho-oncology (CHeRP and infrastructure support from the Hunter Medical Research Institute)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Clinics were randomly assigned to 1 of 2 treatment arms or to a control arm via random number function in SAS statistical software
Allocation concealment (selection bias)	Unclear risk	Services not blind to study allocation but unclear about allocation concealment
Incomplete outcome data (attrition bias) All outcomes	Low risk	Between 11% and 15% lost to follow-up or declined to participate at 12-month follow-up
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Objective measure (cotinine)
Other bias	High risk	• Variability in quality and consistency of advice given to parents/caregivers to access NRT may bias the effect estimate towards the null • Exposure misclassification; non-smoking parents/caregivers had partners who smoked and this was not measured. Furthermore, self-reported SHS exposure was not validated at baseline assessment • Not blinded, meaning prone to detection and performance bias

Davis 1992

Methods	Country: USA Setting: telephone smoking cessation helpline RCT. Randomised by day of the week, but counsellors blinded to the guide being used
Participants	630 smoking mothers with children younger than 6 years of age calling the helpline
Interventions	Callers to a telephone smoking cessation assistance service were randomised to receive 1 of 3 self-help guides. One was specifically written for the target audience, another was received from the American Lung Association, and 1 was developed by the National

Davis 1992 (*Continued*)

	Cancer Institute. Callers to the line received individual stage-based counselling and were sent the guide by mail
Outcomes	Six months later, the participant was called and was interviewed for 10 minutes about the use of the guide, opinion of the guide, quit attempts and strategies to quit, and current smoking
Type of intervention	Community-based
Notes	Retention: 630/873 (72%)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Quasi-randomised: "Guides were assigned randomly to those in the target audience based on a preassigned list randomized by the day of the week."
Allocation concealment (selection bias)	Low risk	"CIS counsellors were blinded regarding which self-help guides subjects would receive."
Incomplete outcome data (attrition bias) All outcomes	Low risk	28% lost to follow-up; "completion rates were similar for subjects in the three guide groups"
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"Follow-up interviews were conducted by trained interviewers who were blinded regarding subject assignment.... Surrogate interviews were conducted to verify the smoking status of those who reported that they had quit smoking..."

Eakin 2014

Methods	Country: USA Setting: community (Head Start programme) Type: RCT
Participants	330 caregivers (parent or legal guardian) of children aged 6 months to 6 years who reported 1 or more smokers living in the home and who spoke English
Interventions	Intervention: motivational interviewing (MI) and education MI: over 3 months, offered caregivers 4 telephone counselling sessions (15 to 30 minutes in length each) plus 1 booster 15-minute session after 3-month assessment, for a total of 5 sessions

Eakin 2014 (*Continued*)

	Education: included EPA Smoke Free Home educational activities and materials as part of the Head Start programme, including staff training workshops about risks of and strategies for reducing SHS exposure, and expert facilitation of Head Start educational activities Control: education alone
Outcomes	Child exposure: air nicotine, salivary cotinine, caregiver-reported home smoking ban, and smoking cessation Target behavioural change: smoking cessation and home smoking ban
Type of intervention	Community-based
Notes	Conflict of interest: unclear Source of funding: National Heart Lung Blood Institute grant HL092901

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Block randomisation scheme of groups of 10 to ensure equal group sizes. Use of random number generator
Allocation concealment (selection bias)	Low risk	Randomisation assignments were placed into sealed envelopes, which were opened after families completed baseline surveys. Research assistants who completed assessments were not masked to the intervention condition
Incomplete outcome data (attrition bias) All outcomes	High risk	73% and 66% of the intervention group completed 6- and 12-month assessments, compared with 85% of the education-alone group completing both assessments
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Not blinded but objective measure (cotinine)
Other bias	High risk	Misclassification bias; caregiver smoking status was not verified biochemically

Ekerbicer 2007

Methods	Country: Turkey Setting: school with intervention including telephone calls RCT
Participants	Parents of school children exposed to ETS aged 9 to 11 years attending a private primary school
Interventions	Group 1: • Parents interviewed by a psychologist trained in smoking addiction Group 2: • Parents informed of child's urinary cotinine result through a letter
Outcomes	Child urinary cotinine concentrations at 9 months from baseline
Type of intervention	Community-based
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Participants were "randomly assigned", but method was not described
Allocation concealment (selection bias)	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	Full follow-up
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biological measure used

Elder 1996

Methods	Country: USA Setting: schools RCT. Cluster randomisation by school
Participants	96 elementary schools in 4 states
Interventions	Trial of school-based cardiovascular health promotion, including an intervention designed to limit child ETS exposure Intervention: consisted of promoting adoption of a formal tobacco-free policy for the school and providing classroom- and home-based programmes for students Control: Schools participated in the evaluation but received no recommendations for policy or for classroom- or home-based interventions. Control schools were not restricted from taking up tobacco-free policies

Elder 1996 (*Continued*)

Outcomes	At 2 years: • School principals (or delegates) were surveyed with respect to their school's policy on tobacco and the degree to which the policy was observed
Type of intervention	Community-based
Notes	Retention: 96/96; this is the CATCH study

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Ten schools at each site were randomly assigned to the control condition and 7 schools each to a school-based intervention (food service, physical education, classroom curricula) or the school-based plus family intervention program"; no further information given
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Low risk	100% of third grade teachers and 67% of students attended Family Fun Nights; 100% of schools remained in the dietary assessment process
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not specified

Emmons 2001

Methods	Country: USA Setting: family home Type: RCT
Participants	291 smoking parents (or grandparents) living with a child younger than 3 years old, recruited from hospital labour and delivery logs; community health centres and healthcare providers; self-referral
Interventions	Intervention: received a 30- to 45-minute motivational interview at the parent's home with a trained health educator and 4 follow-up telephone counselling calls (approximately 10 minutes each), aiming to reduce household ETS exposure and to increase the smoker's level of readiness for change. Feedback was provided on baseline household air nicotine, parent's CO level, and smoking-related respiratory symptoms. Self-help materials targeting ETS reduction and smoking cessation strategies were also provided.

Emmons 2001 (*Continued*)

	Control: self-help materials only; cessation manual; ETS reduction tip sheet; resource guide
Outcomes	ETS exposure measured by air monitors at baseline and at 6 months Quitting and CPD by parent
Type of intervention	Well-child (peripartum)
Notes	Retention: 247/291 (85%)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"A computer-generated randomization table was used."
Allocation concealment (selection bias)	Low risk	"Randomization information was kept from study staff until the baseline assessment was completed."
Incomplete outcome data (attrition bias) All outcomes	Low risk	ITT analysis used; similar rates of follow-up in both groups: 123/141 control, 124/150 intervention
Blinding of outcome assessment (detection bias) All outcomes	Low risk	ETS exposure was measured by air monitors; results did not rely on self-report

Eriksen 1996

Methods	Country: Norway Setting: health centres RCT
Participants	443 families with 1 or more smoking parent presenting with a child to a well baby check at 6 weeks or 2 or 4 years
Interventions	Intervention: 5-minute counselling from health visitor on harmful effects of parent smoking on children and how to prevent them (stop smoking indoors/in living rooms or quit completely). Three brochures distributed (harm of passive smoking, measures to prevent passive smoking, self-help cessation manual) along with a list of smoking cessation courses Control: given no information unless participants asked for it, until after the period of study. Physicians were asked to withhold their usual advice. Self-completed questionnaires were administered at the visit and 1 month later
Outcomes	Parent behaviour by self-report at baseline and at 1 month

Eriksen 1996 (*Continued*)

Type of intervention	Well-child (child health check)	
Notes	Retention 363/443 (82%)	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	"Randomly allocated"; method of sequence generation not specified
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Low risk	ITT analysis; exact numbers not provided: "The withdrawal was small and probably not intervention related because the proportion of drop-outs was about the same in both groups"
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Self-report only, no validation used; however no evidence of effect, so differential misreport judged to be unlikely
Other bias	Unclear risk	"A "contamination" of information may have taken place from the intervention group to the control group because parents from the two groups may have talked together during the study period."

Fossum 2004

Methods	Country: Sweden Setting: community, child health centres CT
Participants	41 mothers of newborn infants attending participating child health centres
Interventions	Intervention: 'smoke-free children' counselling provided by nurses Control: usual care
Outcomes	3 months: • Self-reported smoking habits (number of cigarettes smoked) • Maternal cotinine levels
Type of intervention	Well-child (child health check)

Fossum 2004 (*Continued*)

Notes	Retention: 100% for self-report measures. Cotinine follow-up measures: 85% intervention, 57% control	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	No randomisation used
Allocation concealment (selection bias)	High risk	No randomisation used, and further control centres recruited due to low participant recruitment at original control centres
Incomplete outcome data (attrition bias) All outcomes	High risk	100% retention for self-report, but more participants refused to provide cotinine samples in control (57% provided cotinine) than intervention (85% provided sample) groups
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used

French 2007

Methods	Country: USA Setting: recruited from the hospital postpartum unit. Intervention involved home visits and telephone calls by nurses CT: intervention and control groups enrolled over different time periods	
Participants	Postpartum women who had quit smoking during their pregnancy	
Interventions	Intervention: motivational interviewing, one 15-minute home visit and 2 subsequent phone calls for less than 15 minutes each Control: usual care, which involved a home visit by a nurse with no smoking intervention	
Outcomes	Final data collection 6 months from baseline Maternal self-reported smoking status and salivary cotinine level	
Type of intervention	Well-child (peripartum)	
Notes	71/219 attrition at 6 months	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**

French 2007 (*Continued*)

Random sequence generation (selection bias)	Unclear risk	Not applicable
Allocation concealment (selection bias)	Unclear risk	Women in intervention and control groups had separate consents
Incomplete outcome data (attrition bias) All outcomes	High risk	Control group: 80% and 65% were available for data collection at 3 and 6 months, respectively Intervention group: 87% and 69% provided information at 3 and 6 months, respectively
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used
Other bias	High risk	Groups differed in marital status, depression scores, and previous quit attempts. Separate consent forms were used for women in control and intervention groups

Greenberg 1994

Methods	Country: USA Setting: recruited at maternity hospitals; intervention in family home RCT
Participants	933 mothers (141 who smoked) of newborn babies
Interventions	Factorial design, 'full' vs 'reduced' data collection. Full group visited at home when infants approximately 3 weeks old and had 2-weekly telephone questionnaire. Intervention: A study nurse visited homes 4 times for 45 minutes delivering a programme aimed at developing a mother's skills at maintaining a smoke-free environment for her child: information re child ETS exposure, sources of ETS, and required the mother's participation. Written resources were left with the mother. Follow-up visits were made 1, 3, and 5 months later. Control: The only contact was made for data collection.
Outcomes	'Full' subgroup was surveyed and urine was collected at baseline. Data were collected again in homes when infants were 7 and 12 months old. Data on lower respiratory symptoms were collected by telephone survey every 2 weeks, in full subgroup
Type of intervention	Well-child (peripartum)
Notes	Full data for 583/933 (62%)

Greenberg 1994 (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Computer-generated list of random numbers"
Allocation concealment (selection bias)	Low risk	Allocation was performed by "a member of the administrative staff who was not involved with the conduct of the study"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Similar rates of follow-up in both groups (67% intervention, 75% control)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used

Groner 2000

Methods	Country: USA Setting: hospital RCT
Participants	479 smoking mothers accompanying a child younger than 12 years to a hospital
Interventions	Two intervention groups ('Child's Health Group' (CHG); 'Mother's Health Group' (MHG)) and a control group Intervention: received a brief (10- to 15-minute) counselling session given by a trained nurse while waiting to see a doctor. Participants in the CHG were informed of the hazards of ETS for their child, but not for themselves; participants in the MHG were informed of the effects of smoking on their own health, but not on their child's health. They were given standard self-help manuals and materials specific to their group allocation. Notably, even mothers in the CHG were not encouraged to change their smoking location. They received reminder postcards at 2 weeks and at 4 months post intervention encouraging them to quit. Control: received usual care with no additional advice about smoking
Outcomes	Maternal smoking status; stage of change; CPD; smoking location; knowledge of ETS effects at 6 months Assessment by telephone at 1 and 6 months post intervention, blinded assessor, or mailed questionnaire
Type of intervention	Child with health problems (ill-child health care)
Notes	Retention: 232/479 (48%)
Risk of bias	

Groner 2000 (*Continued*)

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"Random numbers table"
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Low risk	High loss to follow-up (52% lost at 6 months) , but "there were no significant differences between subjects who completed the 2 follow-ups and other subjects in terms of... group assignment or any other baseline variable. Subjects lost to follow-up were considered continuing smokers, using the "intent to treat" model of analysis"
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Self-report only, but no evidence of effect shown, so differential misreport judged to be unlikely

Hafkamp-de 2014

Methods	Country: The Netherlands Setting: community well-child centres Type: RCT
Participants	7775 parents of children aged 1 to 4 years
Interventions	Intervention: If the child had recent asthma-like symptoms, well-child professionals provided an information leaflet and advised the parent to see a GP if not on treatment. If the child had already been treated by a GP or a paediatrician, well-child professionals could refer them to an asthma nurse if symptom-free; they were advised to see their GP if they experienced symptoms. If exposed to ETS, health risks of ETS exposure were discussed as well as whether parents could be motivated and prepared to stop exposing their child (house rules), and parents were given an info leaflet about preventing child ETS exposure Control: routine practice, addressing the presence of general health symptoms and ETS exposure (at least at age 18 months). However, no specific or systematic assessments of asthma-like symptoms and ETS exposure were performed
Outcomes	Child exposure: parent-reported ETS exposure at home Child illness: parent-reported physician-diagnosed asthma (ever), current wheezing frequency and quality of life; also measured airway inflammation (exhaled NO, FeNO) and airway resistance (Rint)
Type of intervention	Well-child (child health check)

Notes	Conflict of interest: none declared Source of funding: Netherlands Organization for Health Research and Development (ZonMw: project no. 22000128). LD received funding by means of a European Respiratory Society/Marie Curie Joint Research Fellowship (MC 1226-2009) under grant agreement RESPIRE, PCOFUND-GA-2008-229571. VWJ received additional grants from the Netherlands Organization for Health Research and Development (ZonMw - VIDI)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	16 well-child centres ranked on the basis of the socioeconomic status of their neighbourhood. Then centres in each subsequent couple were randomly assigned to intervention (n = 8) or control (n = 8) groups. Method of randomisation not stated
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	High risk	Response rate at first (71%), second (76%) , third (72%), fourth (73%), and sixth (68%) years of life
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Parents not aware of research condition. However, unclear whether researchers measuring outcomes were aware of treatment group
Other bias	High risk	• Owing to possible contamination of intervention and control groups if families moved to other neighbourhoods and visited other well-child centres, analyses were compared as both intention-to-treat and per-protocol • Sensitivity analyses were performed with and without multiple imputation to handle missingness • Variation was evident in the way the intervention was delivered, with well-child professionals tending not to repeat interventions that had been delivered at previous visits • Information bias and misclassification were due to parental reports

Halterman 2011

Methods	Country: USA Setting: school, with intervention at home RCT
Participants	Children aged 3 to 10 years with diagnosed asthma attending preschool or elementary school in the Rochester City School District and their families
Interventions	Intervention: motivational interviewing to counsel the primary caregiver about reducing smoke in the home and to provide brief smoking cessation counselling with the primary caregiver (if a smoker). Counselling of an additional household smoker who spends the most time with the child. Booster telephone calls at 1 and 3 months after counselling. Children received observed inhaler administered by a school nurse Control: Participants were advised to contact their child's paediatrician regarding persistent asthma symptoms
Outcomes	Seven- to nine-month follow-up from baseline: • Child salivary cotinine • Asthma symptoms in peak winter season, November to February • Asthma symptom-free days per 2 weeks • Asthma symptom-free nights per 2 weeks • Days with activity limitation per 2 weeks • Days with rescue medication use per 2 weeks • Days absent due to asthma per 2 weeks • Acute office and emergency department visits, and hospitalisations, for an acute exacerbation of asthma
Type of intervention	Child with health problems (respiratory disorders)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Used blocked randomisation, 1:1 ratio, with scheme created by the biostatistics centre, stratified by smoking exposure at home
Allocation concealment (selection bias)	Unclear risk	Method of randomisation mentioned, but not clear whether allocation was adequately concealed
Incomplete outcome data (attrition bias) All outcomes	Low risk	5 withdrawals from each arm (N = 140 for intervention and N = 145 for control)
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Interviewers blinded but children's parents not blinded

Hannover 2009

Methods	Country: Germany Setting: recruited from maternity wards, with intervention at home RCT
Participants	Mothers of neonates who smoked during pregnancy or quit shortly before pregnancy
Interventions	Intervention: Counselling session based on motivational interviewing and relapse prevention and 2 telephone booster sessions 4 and 12 weeks after counselling Both groups received information brochures for themselves and their partners
Outcomes	Twenty-four-month follow-up from baseline: • Proportion of mothers who quit • Proportion of mothers who did not restart smoking
Type of intervention	Well-child (peripartum)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Allocated women to intervention or control, alternating the order on screening forms
Allocation concealment (selection bias)	High risk	Whether allocation sequences would begin with treatment or control condition was decided ad hoc
Incomplete outcome data (attrition bias) All outcomes	High risk	High number revoked participation after randomisation, and 25% were not followed up at 24 months
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"The nature of our intervention made blinding impossible." But later says follow-up assessment interviews were conducted by trained interviewers, who did not screen or counsel the women and were blind to the women's group membership
Other bias	High risk	No ITT analysis

Harutyunyan 2013

Methods	Country: Armenia Setting: community Type: RCT
Participants	250 households with non-smoking mothers and at least 1 child 2 to 6 years of age living with at least 1 daily smoker
Interventions	Intervention: in-person counselling session with the non-smoking mother and at least 1 daily smoker in each household, with distribution of a tailored educational brochure and demonstration of measurement of indoor PM2.5 (at second baseline visit); also included 2 follow-up counselling telephone calls 1 and 2 months after the initial session. Intervention based on the motivational interviewing technique Control: brief educational leaflet on the hazards of SHS only
Outcomes	Child exposure: children's hair nicotine and self-report (questionnaire) Target behaviour change: smoking restriction Target knowledge change: health risks of ETS exposure
Type of intervention	Community-based
Notes	Conflict of interest: none declared Source of funding: FAMRI (Flight Attendant Medical Research Institute) Center of Excellence in Translational Research at Johns Hopkins University

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	250 recruited households were assigned random numbers from 1 to 250; households with odd numbers were included in the intervention group, and those with even numbers were included in the control group
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	High risk	92% follow-up, but only 56% provided hair samples for nicotine measurement
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Single-blind; participants were unaware of their assignment status, the study hypothesis, and details of intervention and control group procedures

Herbert 2011

Methods	Country: Canada Setting: recruited from 5 public health nursing offices, 8 day care centres and kindergartens on Prince Edward Island. Intervention in the community RCT
Participants	Parents with children younger than 5 years of age exposed to ETS
Interventions	Group sessions held once a week for 3 consecutive weeks, followed by weekly telephone calls for 3 additional weeks Both groups received a brochure on ETS.
Outcomes	Six-month follow-up from baseline: • Parent report on the average number of cigarettes smoked in the home daily • Implementation of a total ban on smoking in the household
Type of intervention	Community-based
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated randomisation sequence with block sizes of 4 or 6
Allocation concealment (selection bias)	Low risk	Sequentially numbered opaque, sealed envelopes
Incomplete outcome data (attrition bias) All outcomes	Low risk	9/30 non-attenders for intervention; ITT analysis done
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Phone interviews conducted and participants asked how they found the programme, so interviewer could not be blind

Hovell 2000

Methods	Country: USA Setting: individual counselling in person and by phone RCT
Participants	108 mothers smoking at least 2 CPD with child/ren < 4 years, using a supplemental nutrition programme
Interventions	Intervention: Mothers given 7 individualised counselling sessions (3 in person, 4 by phone) designed to reduce child exposure to ETS. Mothers recorded their smoking and child's exposure and were given "no smoking" signs and stickers; at subsequent sessions,

Hovell 2000 (*Continued*)

	new objectives were set and positive feedback was given to mothers, when appropriate. Total duration: 3 months Control: usual care nutritional and brief advice about smoking and child ETS exposure
Outcomes	Child urine cotinine, reported exposure, parental smoking Mothers were surveyed at 3, 6, and 12 months; urine was collected at baseline and at 6 and 12 months
Type of intervention	Child with health problems (ill-child health care)
Notes	Retention: 96/108 (89%)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Random numbers were used to stratify assignments by three ethnic groups."
Allocation concealment (selection bias)	Unclear risk	"After the baseline measures, assistants opened an envelope to reveal assignments. " No further information provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	ITT analyses; more losses to follow-up in intervention than control groups (42/53 intervention provided 12-month urine sample, 52/55 control provided sample)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used "Measurement assistants were blind to group assignment. Control families were unaware of counselling procedures, and investigators were blind to results until all data were collected."

Hovell 2002

Methods	Country: USA Setting: community Type: RCT
Participants	204 families with an asthmatic child from 3 to 17 years of age whose natural parent(s) were Latino or Hispanic, who lived with at least 1 smoker, and who reported exposure to at least 6 cigarettes the previous week

Hovell 2002 (*Continued*)

Interventions	Intervention: asthma management education session delivered in the home, including generic advice to reduce child exposure to ETS. Follow-up coaching consisting of 7 in-home sessions of 30 to 45 minutes over 3 months plus follow-up phone call Control: asthma management education session and follow-up visits for measurement only
Outcomes	At 4, 7, 10, and 13 months: • Parental report of child ETS exposure • Child's urinary cotinine • Air nicotine levels (20% of homes) • Parental saliva cotinine
Type of intervention	Child with health problems (respiratory disorders)
Notes	Retention: 188/204 (92%). 11 participants dropped out before randomisation; 5 dropped out before outcome measurement

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"An Excel computer-generated list of random 3-digit numbers was constructed by clinic site."
Allocation concealment (selection bias)	Unclear risk	"Participants were assigned to the coaching condition and control condition based on numbers ending with even and odd digits. " No further information given
Incomplete outcome data (attrition bias) All outcomes	Low risk	ITT analysis conducted. Low dropout rate: 3 control families, 2 intervention families; "little or no sampling bias attributable to attrition"
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used "Control families were unaware of coaching procedures and continued in the study for measurement purposes only. Interviewers were blind to group assignment and investigators were blind to results until all data were collected."

Hovell 2009

Methods	Country: USA Setting: at home RCT
Participants	Mothers who smoke, with children younger than 4 years
Interventions	Intervention: 10 in-person at-home and 4 telephone counselling sessions over 6 months, with additional pre-quit and post-quit telephone sessions Control: referral to the free California Smoker's Helpline (usual care)
Outcomes	Eighteen-month follow-up from baseline: • Children's urine cotinine concentration • Parents' smoking status - self-reported and confirmed with salivary cotinine • Air nicotine measured in randomly selected homes
Type of intervention	Child with health problems (ill-child health care)
Notes	Recruited from the Supplemental Nutrition Programme for Women, Infants, and Children

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"random number list was used to assign pairs of participants matched on child's gender, ethnicity and recruitment site"
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Low risk	18-Month interview 64/74 control group and 66/76 intervention group
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"Data collection research assistants were blind to group assignment, and control families were unaware of counselling procedures. Investigators were blind to results until all data were collected."
Other bias	High risk	However, "baseline children's urinary cotinine concentration was significantly higher among controls, indicating that randomization did not balance the groups with respect to cotinine"

Hughes 1991

Methods	Country: Canada Setting: hospital and home, asthma management programme RCT
Participants	95 children admitted to hospital in the previous 5 years with asthma, along with their parents (not all smokers)
Interventions	Intervention: cared for by a paediatric respiratory physician through the 12-month study period. In addition, seen at clinic visits and visited at home by a nurse co-ordinator who provided written information about asthma care and carried out an asthma educational session around lung and airway anatomy, asthma episodes, and treatment. Participant's home visited at least 3 times. Environmental exposures checklist drawn up; role of cigarette smoke discussed; parents discouraged from smoking in the home and encouraged to participate in a smoking cessation programme Control: participants managed by their usual primary care physicians and reviewed by the study physician at intervals
Outcomes	At 12 months: • Exposure to ETS at home (Primary study outcomes were related to asthma management.)
Type of intervention	Child with health problems (respiratory disorders)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"A process of restricted randomization based on age and number of previous hospitalizations during the previous 5 years was carried out. Subjects were alternately assigned to study or control groups, with the initial assignment for each pair determined by a coin toss."
Allocation concealment (selection bias)	Low risk	See above.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low dropout - 3 lost from each group
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Smoking status reliant on self-report; however, no evidence of effect, so differential misreport judged to be unlikely

Irvine 1999

Methods	Country: Scotland Setting: home RCT
Participants	501 smoking parents of children with asthma
Interventions	Intervention: brief advice from a nurse visiting the family home; information about passive smoking and asthma, financial and health benefits of quitting; information on how to stop smoking; advised to move to a different room or outside the home if they did not intend to quit; advised not to allow visitors to the home to smoke. Given 2 leaflets at baseline - 1 commercially available, and the other provided to reinforce the brief advice. Questionnaires were completed. Further leaflets were distributed by mail at 4 and 8 months after baseline along with a letter encouraging them to stop smoking. Control: Participants received the commercial leaflet at baseline but nothing else
Outcomes	At 12 months: • Child's saliva cotinine • Mother's saliva cotinine • Self-reported quit attempts
Type of intervention	Child with health problems (respiratory disorders)
Notes	Retention: 435/501 (87%)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Randomized"; no further information given
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Low risk	86.8% provided samples at follow-up; percentage lost similar in both groups and reasons provided
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical measures used

Joseph 2014

Methods	Country: USA Setting: community (well-child clinic) Type: observational, quasi-experimental (historical control)

Joseph 2014 (*Continued*)

Participants	Parents who smoke who have children aged 12 and 24 months; 40 parent-child couples for intervention group and 40 for control group
Interventions	Intervention: Children had serum cotinine measured with lead screening. Lab results were sent to providers and parents. The letter included an explanation that cotinine came from tobacco exposure, and that the normal value was zero. One week later, the tobacco counsellor proactively telephoned to explain the lab result, to describe potential sources of tobacco smoke exposure, including third-hand smoke, and to convey what is known about the potential health effects of exposure for their child. Counsellor used motivational interviewing and cognitive-behavioural therapy to engage the parent in a smoking cessation attempt. All parents were encouraged to institute a strict home and car no-smoking policy, regardless of whether they wanted to stop smoking. If parent wanted to stop smoking, counsellors offered an 8-session weekly telephone intervention based on an evidence-based telephone smoking cessation protocol. While no prescription or over-the-counter medicine was offered, counsellors did describe them as options and facilitated access where requested Control: historical group that received usual care
Outcomes	Child exposure: outcomes assessed 8 weeks after initial call, including receipt of tobacco treatment, quit attempts, 7-day point prevalent abstinence, and current home and car smoking policies Target behaviour change: receipt of tobacco treatment, parent quit attempts, 7-day point prevalence abstinence
Type of intervention	Well-child (child health check)
Notes	Conflict of interest: unclear Source of funding: National Cancer Institute (R21CA137014)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Not randomised
Allocation concealment (selection bias)	High risk	Allocation concealment not possible, as the study was not randomised
Incomplete outcome data (attrition bias) All outcomes	Low risk	95% followed up
Blinding of outcome assessment (detection bias) All outcomes	High risk	Not blinded
Other bias	High risk	• Recall bias as data ascertained historically in the comparison group

		• Misclassification, as smoking status not biochemically validated in control group

Kallio 2006

Methods	Country: Finland Setting: community, well baby clinics RCT
Participants	1062 families presenting at a well baby clinic in Turku with a child 5 months old
Interventions	Component of larger prospective intervention trial aimed at decreasing exposure of children to known environmental cardiovascular risk factors Intervention: Parents received booklet about the adverse effects of smoking at age 5 years. Counselling from paediatrician and dietician consisted of discussion with parents about major cardiovascular risk factors including smoking. Appointment with paediatrician and dietician at 1- to 3-monthly intervals until age 2 years, then 6 monthly Control: normal health education given to all Finnish families at well baby clinics and throughout the school system. Appointment with paediatrician and dietician at 4- to 6-monthly intervals until age 2 years, then 6-monthly until age 7, then yearly
Outcomes	Follow-up when child 8 years of age: • Parent report of smoking status and habits, reported child exposure to ETS in past 3 days • Parent serum cotinine
Type of intervention	Well-child (child health check)
Notes	Retention: 625/1062 (59%)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	"Random numbers"; further details not provided
Allocation concealment (selection bias)	Unclear risk	Not described
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	High but similar dropout rates in both groups overall (serum cotinine measured in 306/540 intervention and 319/522 control). However, attrition of smokers not quantified and attrition analysis not reported. Trial authors write: "It is possible that smokers have discontinued participation in STRIP more frequently than non-smokers"

Kallio 2006 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used

Kegler 2015

Methods	Country: USA Setting: community (2-1-1 callers) Type: RCT
Participants	498 2-1-1 callers who were either smokers living with at least 1 child or other non-smoker, or non-smokers living with a smoker, and smoking was allowed in the home. Callers to 2-1-1 are disproportionately low income, unemployed, and uninsured, and have received fewer years of education relative to the general population
Interventions	Intervention: Smoke-Free Homes intervention consisted of 3 mailings and 1 coaching call, based on a theme of "Some things are better outside", with content focused on 5 steps to create a smoke-free home. The intervention was delivered over a 6-week period at 2-week intervals, first as a mailing, then as a coaching call, and finally as 2 additional mailings. The coaching call used motivational interviewing Control: measures alone
Outcomes	Child exposure: home smoking ban (self-report), validated with air nicotine levels Target behaviour change: smoking away from home
Type of intervention	Community-based
Notes	Conflict of interest: unclear Source of funding: National Cancer Institute's State and Community Tobacco Control Research Initiative (U01CA154282)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	'Simple' (not block) randomisation, but method not described in detail
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Low risk	83.1% completed 3-month data collection, and 79.1% completed 6-month data collection
Blinding of outcome assessment (detection bias) All outcomes	Low risk	University-based research assistants blinded to study condition collected outcome data at 3 and 6 months post randomisation; objective measure was

Kegler 2015 (*Continued*)

		also used

Kimata 2004

Methods	Country: Japan Setting: hospital outpatient clinic RCT	
Participants	Fifty children with mild atopic eczema/dermatitis syndrome and 25 normal children whose parents smoked 10 to 15 CPD at home	
Interventions	Intervention: not clear: "Parents of the cessation of passive smoking group agreed to stop smoking" Control: usual care	
Outcomes	At 1 month: • Child urinary cotinine • Child skin wheal response • Child plasma neurotrophin levels	
Type of intervention	Child with health problems (ill-child health care)	
Notes	Not provided	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	"Randomly divided"; no further information provided
Allocation concealment (selection bias)	Unclear risk	Not described
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No information provided
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used

Krieger 2005

Methods	Country: USA Setting: community Type: RCT	
Participants	274 low-income households including a child aged 4 to 12 years who had asthma recruited by media publicity, hospitals, and emergency departments	

Krieger 2005 (*Continued*)

Interventions	Intervention: high-intensity intervention with community health workers providing in-home environmental assessments, education, support for behaviour change (7 sessions) , and a full set of resources Control: low-intensity intervention group received a single visit and limited resources
Outcomes	Parent self-report Paediatric asthma caregiver quality of life Self-reported asthma-related urgent healthcare service use Participant report of presence of asthma triggers in the home, including smoking behaviour
Type of intervention	Child with health problems (respiratory disorders)
Notes	Retention: 110/138 (80%) in high-intensity group and 104/136 (76%) in low-intensity group

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"We randomly assigned participants to groups using a permuted block design with varying block size."
Allocation concealment (selection bias)	Low risk	"Sequence numbers and group allocation were concealed in sealed, opaque, numbered envelopes prepared centrally and provided sequentially to interviewers."
Incomplete outcome data (attrition bias) All outcomes	Low risk	"We performed an intention-to-treat analysis by using the baseline value of the outcome variable of interest as the exit value for participants who did not complete the study, which yields a conservative estimate of intervention effect." Similar follow-up rates in both groups (110/138 intervention, 104/136 control)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"The nature of the intervention made it impossible to blind participants and staff to group assignment." However, combination of objective and subjective measures, and all participants received visit from counsellor, so differential misreport unlikely

McIntosh 1994

Methods	Country: USA Setting: clinic RCT
Participants	92 smoking parents of children with asthma
Interventions	Intervention: Child's physician delivered a standardised passive smoking message to parents, consisting of counselling about the effects of passive smoking and advice to quit or smoke outside. Parents were given a specifically designed pamphlet that reinforced this message. About 1 month later, parents received a personalised letter from the principal investigator, containing the results and an explanation of their child's urine cotinine test. Included was a self-help manual aimed at encouraging smoking outside. Control: Parents received the physician's message and the pamphlet only
Outcomes	At 4 to 6 months: • Self-reported location of smoking, attempts to quit • Child urine cotinine
Type of intervention	Child with health problems (respiratory disorders)
Notes	Retention: 72/92 (78%)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Families were randomly assigned... at the time of enrolment using a coin toss method."
Allocation concealment (selection bias)	Low risk	See above.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Slightly higher dropout rate in control group than in intervention group (37/44 followed up in intervention, 35/48 followed up in control), ITT analysis not reported, but per-protocol analysis more conservative in this instance, so judged to be at low risk of bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemically validated outcome

Nicholson 2015

Methods	Country: USA Setting: hospital Type: RCT
Participants	119 parents or guardians of children receiving treatment for cancer who lived with at least 1 adult smoker and were exposed to SHS in the home or car setting
Interventions	Intervention: multi-component behavioural programme over 3 months; counselling consisted of 3 individual, face-to-face, biweekly 1-hour sessions followed by 3 25-minute telephone sessions for a total of 6 individual contacts with the counsellor. Parents also received letters from their child's physician at the start and at the end of the counselling phase to acknowledge their participation and progress Control: standard care and equivalent follow-up to intervention arm
Outcomes	Child exposure (and target behaviour change): full smoking ban - defined as a household with smokers that prohibited all smoking in the home and in the car
Type of intervention	Child with health problems (ill-child health care)
Notes	Conflict of interest: none declared Source of funding: Grants CA085406 and CA21765 from the National Cancer Institute and the American Lebanese Associated Charities

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Stratified, blocked randomisation scheme with strata including child's age and race, as well as smoking status of the participating parent
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Low risk	91% follow-up rate
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not specified
Other bias	High risk	Reporting bias: smoking bans self-reported, not validated biochemically

Nuesslein 2006

Methods	Country: Germany Setting: paediatric clinic RCT
Participants	40 mothers attending participating paediatric practice and self-reporting smoked at least 10 CPD
Interventions	All participants received a quit smoking information sheet and had urinary cotinine levels taken. Intervention: received results of their cotinine levels within 1 week Control: did not receive results of cotinine levels until data collection was complete
Outcomes	At 6 weeks: • Maternal self-report of tobacco consumption • Urinary cotinine levels
Type of intervention	Mixed/not stated
Notes	Nicotine consumption did not differ at baseline (median 12 μg for both)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Randomised by participant numbers (odd or even)
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Low risk	Only 2 (of 40) missing at final follow-up
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used

Ortega 2015

Methods	Country: Spain Setting: community (primary paediatric care) Type: RCT (cluster)
Participants	1101 smoking parents of babies younger than 18 months
Interventions	Intervention: brief intervention based on the '5 A's' approach, carried out during regular well baby visits at paediatric primary care team offices, lasting less than 10 minutes each time and with at least 3 occurrences: at baseline, at 3-month follow-up, and at 6-month follow-up Control: usual care

Ortega 2015 (*Continued*)

Outcomes	Child exposure: hair nicotine level and parents' reported measures to avoid baby's exposure to tobacco smoke pollution at home, in the car, and in other settings Target behaviour change: smoking away from child in home, in car, or in other setting
Type of intervention	Mixed (primary paediatric care includes both well- and ill-child healthcare services)
Notes	Conflict of interest: none declared Source of funding: Spain's National Committee on Smoking Prevention (Comité Nacional de Prevención del Tabaquismo) and the Public Health Agency of the Catalan Government (Direcció General de Salut Pública, Generalitat de Catalunya)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Randomised using SPSS version 15.0, with primary care teams as the unit of randomisation
Allocation concealment (selection bias)	Low risk	Not specified, but allocation was randomised by a central computer
Incomplete outcome data (attrition bias) All outcomes	Low risk	83% follow-up rate
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Not blinded but biological measure (objective)
Other bias	High risk	• Groups were statistically significantly different at baseline • Hawthorne effect/observer bias in control group

Patel 2012

Methods	Country: USA Setting: hospital emergency department RCT
Participants	Child aged < 36 months with a smoking caregiver presenting to the emergency department
Interventions	Intervention group received brief education about third-hand smoke; control group received "routine education" from the emergency physician
Outcomes	Caregivers' change in smoking status or policies for smoking in the home or in the car

Patel 2012 (*Continued*)

Type of intervention	Child with health problems (ill-child health care)	
Notes	N = 40; 65% loss to follow-up	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided
Allocation concealment (selection bias)	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	High risk	65% loss to follow-up from a small sample
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information provided; objective measure not used
Other bias	High risk	Selection - very small sample size, convenience sample; reporting of results unclear in terms of how numbers were derived and whether ITT analysis was performed

Phillips 2012

Methods	Country: USA Setting: hospital RCT
Participants	Mothers who had previously smoked who had babies in the neonatal intensive care unit
Interventions	Intervention: given information about bonding with the infant Both groups given handouts regarding second-hand smoke exposure; neonatologist used motivational interviewing to prevent reuptake of smoking by the mother
Outcomes	Eight-week follow-up from baseline: • Re-uptake of smoking by mother, measured by self-report, carbon monoxide oximetry, and salivary cotinine
Type of intervention	Child with health problems (ill-child health care)
Notes	
Risk of bias	

Phillips 2012 (*Continued*)

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random table
Allocation concealment (selection bias)	Low risk	Sequentially numbered opaque envelopes
Incomplete outcome data (attrition bias) All outcomes	High risk	Salivary cotinine levels on only 67% of mothers who completed the study (45% from control and 55% from intervention)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biological measure used
Other bias	High risk	Small numbers - intervention N = 24 and control N = 30. More mothers in the intervention than in the control group had private insurance (P = 0.02). Trend for infants in the intervention group to have lower birth weight (P = 0.08) and longer stay (P = 0.08). Insurance was found to be significantly associated with Kaplan-Meier, remaining smoke free, and investigators tried to control for this

Pollak 2015

Methods	Country: USA Setting: community (home and telephone) Type: RCT
Participants	348 expectant Latino couples (mothers and their male partners who smoked)
Interventions	Intervention: culturally tailored couples-based intervention plus written materials (self-help smoking cessation guide) and free NRT Control: minimal intervention involving written materials plus NRT
Outcomes	Target behaviour change: smoking cessation, measured by 7-day point-prevalence abstinence and 30-day point-prevalence abstinence at baseline, at the end of pregnancy, and 12 months post randomisation. Also assessed continuous abstinence and validated data with salivary cotinine from men
Type of intervention	Community-based
Notes	Conflict of interest: none declared Source of funding: Grant R01CA127307

Pollak 2015 (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Preset randomisation list stratified on whether men were daily or non-daily smokers and first time fathers or not
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Low risk	81% follow-up rate by 12 months
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Objective biological measure (unclear whether blinding occurred)
Other bias	Low risk	Social desirability bias is more common in Latinos, but this does not vary between intervention and control groups

Prokhorov 2013

Methods	Country: USA Setting: home RCT
Participants	Households with a child younger than 18 years of age and 2 adults, 1 of whom was a smoker
Interventions	One culturally appropriate bilingual comic book for children and 2 fotonovelas for adults
Outcomes	Reduced household smoking - report and 2 nicotine air sampling monitors Self-reported smoking status given (for the smoker) Increase in knowledge of health effects of SHS
Type of intervention	Well-child (child health check)
Notes	

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Method of randomisation not specified
Allocation concealment (selection bias)	Unclear risk	Not stated

Prokhorov 2013 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	High risk	76 of 91 households completed 12 months of follow-up; no ITT analysis stated
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Environmental nicotine monitors as outcome
Other bias	High risk	No ITT analysis. Air nicotine levels higher in intervention group but not significantly so

Pulley 2002

Methods	Country: USA Setting: recruited from postpartum units, intervention involved home visits Quasi-experimental RCT
Participants	Postpartum mothers who smoke and breastfeed infants
Interventions	Intervention: educational intervention regarding "smoking hygiene" to reduce ETS exposure of infant. Education was delivered by a nurse, and participants were given an educational pamphlet. Air purifiers were provided Control: data collection only
Outcomes	Mothers completed a smoking habits questionnaire at baseline and at completion of the follow-up period, 3 weeks later Frequency of respiratory symptoms in the infant and hospitalisation were recorded at baseline and 3 weeks later
Type of intervention	Well-child (peripartum)
Notes	8/29 dropped out after enrolment. Follow-up period was 3 weeks

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided
Allocation concealment (selection bias)	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	High risk	Eight dropped out (25%), 4 from each arm - very high attrition - left 12 in intervention group and 9 in control group. No ITT performed

Pulley 2002 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	High risk	Data collector aware to which group participants were assigned
Other bias	High risk	Significant difference in numbers of cigarettes smoked during pregnancy between intervention (significantly higher) and control groups - P = 0.26. No ITT analysis. Very small study

Ralston 2008

Methods	Country: USA Setting: hospital RCT
Participants	Smoking caregivers of children hospitalised for respiratory illness
Interventions	Intervention: counselling according to current clinical practice guidelines (US Public Health Guidelines: "Treating Tobacco Use and Dependence"). This includes nicotine replacement therapy Control: received a brief antismoking message and referral to the state's quit line
Outcomes	Six-month follow-up post hospitalisation: • Self-report of parental smoking cessation • Parental quit attempts • Proportion reporting they set a quit date
Type of intervention	Child with health problems (respiratory disorders)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided
Allocation concealment (selection bias)	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	High risk	High attrition but those lost to follow-up treated as smokers. Unclear from which arm data are missing
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information provided

Ralston 2008 (*Continued*)

Other bias	High risk	Very small study, so may produce spurious results - only 20% of those eligible participated. Differences in baseline group measurement

Ralston 2013

Methods	Country: USA Setting: hospital RCT
Participants	Tobacco smoking caregiver over 18 years of age with a hospitalised child
Interventions	Intervention: brief intervention recommending tobacco cessation followed by referral to the state tobacco quit line and receipt of a smoking cessation brochure produced by the American Cancer Society. Both groups received an age-appropriate injury prevention brochure
Outcomes	Primary outcome: Self-reported quit status (defined as self-reported abstinence for at least 1 week) Secondary outcomes: Decrease in cigarettes smoked per day; increase in importance of quitting on a 1 to 10 scale; report of any contact with state quit line
Type of intervention	Child with health problems (ill-child health care)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random numbers computer generated
Allocation concealment (selection bias)	Low risk	Sequential sealed envelopes used
Incomplete outcome data (attrition bias) All outcomes	High risk	High level of loss to follow-up (N = 19/60; 32%). However, ITT analysis was performed, and those lost to follow-up were treated as ongoing smokers
Blinding of outcome assessment (detection bias) All outcomes	High risk	Telephone interviewers were not always blinded (but did have a script)

Ratner 2001

Methods	Country: Canada Setting: community Type: RCT
Participants	251 mothers who had quit smoking during pregnancy
Interventions	Intervention: Mothers received nurse-delivered telephone support, relapse prevention training, and information resources. Control: usual care
Outcomes	Self-report of smoking status Biological verification with exhaled CO
Type of intervention	Well-child (peripartum)
Notes	Retention: 238/251 (95%)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Identification numbers randomly assigned to 2 groups, in blocks of 50, via a computer software package."
Allocation concealment (selection bias)	Unclear risk	No details provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	Similar rates of follow-up in both groups at 12 months and 95% retention (238/251)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used at in-person follow-ups (89% of participants) "Only 1.4% of the self-reports of abstinence were contradicted by CO readings of $\geq$ 10 ppm; these women were classified as smokers."

Schonberger 2005

Methods	Country: Netherlands Setting: community RCT; cluster
Participants	476 children seen to be at high risk of asthma recruited during the prenatal period
Interventions	Intervention: 3 home visits (2 prenatal and 1 postnatal) with recommendations to reduce 4 main environmental exposures of mite allergens, pet allergens, food allergens, and passive smoking prenatally and postnatally

Schonberger 2005 (*Continued*)

	Control: usual care
Outcomes	Parent report of child ETS exposure Maternal CO Child IgE Tidal airway resistance and lung function Allergen measures
Type of intervention	Well-child (peripartum)
Notes	Retention: 443/476 (93%)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Prerandomisation; no further information provided
Allocation concealment (selection bias)	Unclear risk	"To prevent contamination... the prerandomisation was performed in clusters, taking into account the post (zip) code of the domicile of the recruited family in combination with the location of the general practice the family attended. Once a general practice was allocated, every family subsequently recruited in that practice was allocated automatically to the same group."
Incomplete outcome data (attrition bias) All outcomes	Low risk	93% retention; similar number completed follow-up in both groups (222/242 intervention, 221/234 control); attrition and ITT analyses performed
Blinding of outcome assessment (detection bias) All outcomes	High risk	Self-report only: "reporting bias cannot be excluded as an explanation for the decrease in asthma-like symptoms in the intervention group at age 2 yrs."

Schuck 2014

Methods	Country: Netherlands (nationwide) Setting: community (telephone) Type: RCT
Participants	512 smoking parents of primary school children aged 9 to 12 years

Schuck 2014 (*Continued*)

Interventions	Intervention: up to 7 counsellor-initiated telephone calls during a period of 3 months. All participants also received 3 books entitled "Smoke-Free Parents". Booklets were sent at 3 time points throughout the study (immediately after the first call, 2 weeks after the first call, and 6 weeks after the first call). Time points corresponded with contents of the booklets (deciding and preparing, initiating and maintaining abstinence, and preventing relapse) Control: self-help brochure, together with information on use of NRT and pharmacotherapy
Outcomes	Child exposure: home smoking ban Target behavioural change: smoking cessation, measured by 7-day point-prevalence abstinence at 12-month follow-up, 7-day point-prevalence abstinence at 3-month follow-up, and prolonged abstinence (defined as report of 7-day point-prevalence abstinence at 3 and 12 months and report of cessation for at least 6 months at 12-month follow-up). Also measured use of and adherence to NRT and pharmacotherapy. Subsample of those reporting abstinence were biochemically validated using exhaled CO and salivary cotinine
Type of intervention	Community-based
Notes	Conflict of interest: none declared Source of funding: ZonMW, the Netherlands Organization for Health Care Research and Development (grant number: 50-50110-96-639)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated allocation sequence, in blocks of 10 to ensure equal group sizes, and stratified to ensure balance of key characteristics (gender, educational level, and cigarettes smoked per day)
Allocation concealment (selection bias)	Unclear risk	Independent researcher performed allocation of participants, but first trial author prepared mailings informing participants about the treatment they would receive
Incomplete outcome data (attrition bias) All outcomes	Low risk	85.5% follow-up in treatment group, and 91.8% follow-up in the control group
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation (blinding not specified)

Severson 1997

Methods	Country: USA Setting: hospital and well baby clinics RCT; randomization by practice
Participants	2901 mothers of newborn babies who had smoked before pregnancy (1875 smokers, 1026 non-smokers at enrolment)
Interventions	In the first 1 to 3 days after birth in hospital, mothers received a packet containing a brochure and a letter from the paediatrician about the health effects of passive smoking, along with a no smoking sign. Intervention: Mothers received further materials and brief oral counselling from the paediatrician at well baby visits at age 2 weeks and 2, 4, and 6 months. Paediatricians received a 45-minute training session. Control: received the hospital packet only
Outcomes	Primary outcome: Assessment at 6 and 12 months by mailed questionnaire: • Quit rates (sustained at 6 and 12 months, and point prevalence at 12 months) • CPD, readiness to quit, likelihood of quit attempt. Secondary outcomes: • Knowledge of and attitudes towards ETS
Type of intervention	Well-child (peripartum)
Notes	Retention: 2003/2901 (69%) One-tailed t-test employed

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Cluster-randomised by practice; method not described
Allocation concealment (selection bias)	Unclear risk	Method of allocating practices not described. All eligible patients enrolled, "because the survey information was anonymous, and because smoking counselling was considered to be standard medical practice, the study was exempted from the requirements for obtaining informed consent"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Losses to follow-up (31% in each group) assumed to have relapsed; attrition analyses performed

Severson 1997 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	Low risk	No biochemical validation but cluster-randomised by practice; followed up anonymously via survey; differential misreport unlikely

Stotts 2012

Methods	Country: USA Setting: Neonatal Intensive Care Unit, Hospital RCT (3 groups)
Participants	Families with a smoker at home; infant in NICU at high respiratory risk
Interventions	Motivational interviewing. There were three groups; motivational interviewing, usual care, and usual care-reduced measurement. The motivational interviewing group had 2 hospital-based sessions of approximately 40 minutes each, 2 personalised letters, and 2 phone feedback sessions targeting infant ETS reduction. Reduced measurement group refers to reducing follow-up, as this is thought to affect the behaviour of the control group
Outcomes	Air nicotine monitors Infant end-tidal carbon monoxide Self-report measures of home and car smoking bans
Type of intervention	Child with health problems (respiratory disorders)
Notes	In process of publication, information taken from a report

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not stated
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	High risk	High degree of loss to follow-up by 6 months (intervention 51/70 completed, usual care 21/34 completed, and usual care reduced measurement 28/40 completed)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Air nicotine monitors used

Streja 2014

Methods	Country: USA Setting: community (home) Type: RCT
Participants	242 parents or guardians of children aged 2 to 14 years with asthma from low-income, predominantly ethnic minority families, living in households with at least 1 current smoker where smoking had occurred at home
Interventions	Intervention: tailored Spanish/English video addressing implications of SHS exposure for children with asthma, possible efficacy of household SHS exposure reductions on the child's health and frequency of asthma attacks, and strategies to reduce household SHS exposure. A companion Spanish/English workbook was also provided to reinforce messages in the DVD and to encourage discussion among participating and non-participating household members. Brief counselling consisted of asking participants to use the DVD and workbook only. Booster elements included a refrigerator magnet, a mug, and "no smoking" signs to serve as reminders Control: received standard brochures describing the importance of SHS exposure as an asthma trigger
Outcomes	Child exposure: self-reported SHS exposure with two separate surveys of parents/guardians and children; urinary cotinine in children; passive air nicotine monitors in major activity rooms Child illness: child's asthma severity, asthma-related quality of life Target behavioural change: reduced smoking in household (including smoking ban)
Type of intervention	Community-based
Notes	Conflict of interest: unclear Source of funding: National Institutes of Health grants HL53957 from the National Heart, Lung and Blood Institute, Division of Lung Diseases, and CA16042 from the National Cancer Institute

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not specified
Allocation concealment (selection bias)	Low risk	Sealed envelopes with allocations opened after baseline data collection
Incomplete outcome data (attrition bias) All outcomes	High risk	76% follow-up in intervention group and 70% in control group
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Unclear whether blinded, but objective air nicotine measure used

Tyc 2013

Methods	Country: USA Setting: hospital RCT
Participants	Parents or guardians of children receiving treatment for cancer who lived with at least 1 adult smoker and were exposed to SHS in the home or car setting
Interventions	Counselling (multi-component behavioural programme) delivered by trained counsellors over 3 months - 3 individual, face-to-face biweekly 1-hour sessions followed by three 25-minute telephone sessions. Parents received literature about SHS-related health risks for children and for stress management. Did not involve formal cessation counselling. Standard care group given brief advice about removing child from sources of exposure, and advised about adverse health problems
Outcomes	Parent-reported child SHS exposure Child urinary cotinine Parent-reported smoking
Type of intervention	Child with health problems (ill-child health care)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Specific method used to achieve randomisation (e.g. computer-generated random numbers, coin-toss) not described. Stratified, blocked randomisation scheme with strata of child's age (≤ 5, 6 to 12, 13 to 17 years), race (White, non-White), and smoking status of the participating parent (smoker, nonsmoker)
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Low risk	10/135 lost to follow-up; ITT analysis
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Urinary cotinine as measure (objective)

Ulbricht 2014

Methods	Country: Germany Setting: community (home and telephone) Type: RCT
Participants	917 households with parents of children younger than 4 years of age, where at least 1 parent was a smoker
Interventions	Intervention: 15 to 30-minute in-person behavioural change counselling session, a computer-generated feedback letter (including the child's urine cotinine level), and a 5- to 15-minute phone counselling session Control: received the same leaflet as the intervention group about the adverse effects of ETS on children. A letter containing information about the child urine cotinine level at baseline and 12 months later was sent after the 12-month follow-up assessment
Outcomes	Child exposure: child urine cotinine and self-reported SHS exposure, smoking status, and home smoking ban Target behavioural change: home smoking ban
Type of intervention	Community-based
Notes	Conflict of interest: none declared Source of funding: German Cancer AID (Deutsche Krebshilfe, grant no. 107539) and DZHK (German Centre for Cardiovascular Research), partner site Greifswald, Germany (grant no. 81/Z540100152)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not specified
Allocation concealment (selection bias)	Low risk	Screening team blinded to allocation and separate from intervention team
Incomplete outcome data (attrition bias) All outcomes	Low risk	89.7% follow-up in intervention group; 96.4% follow-up in control group
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Objective biological measure, although assessors of baseline and 12-month follow up data were not blind to study group assignment

Van't Hof 2000

Methods	Country: USA Setting: hospital and well baby visits RCT
Participants	Postpartum women with a history of smoking in the 30 days before pregnancy
Interventions	Intervention: Initial nurse delivered relapse prevention counselling for 15 to 30 minutes. At 2-week and 2- and 4-month well baby visits with the paediatric provider, women received reinforcement if they had not restarted smoking. If they had restarted smoking, they were given encouragement and a plan to try to quit again Control: received no counselling and "standard care" from the paediatric provider
Outcomes	Follow-up 6 months from baseline Proportion of mothers who maintain smoking cessation postpartum
Type of intervention	Well-child (peripartum)
Notes	Had salivary cotinine at baseline only

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided
Allocation concealment (selection bias)	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information provided

Vineis 1993

Methods	Country: Italy Setting: immunisation clinic CT: non-random assignment
Participants	1015 parents of newborn babies (all mothers including non-smokers recruited) recruited when attending the clinic for the 3-month vaccination of the infant
Interventions	Intervention: counselled for 15 minutes by a nurse on the health effects of active smoking and ETS, and given 3 booklets - 1 of which was about the health effects of ETS on children Control: did not receive counselling or booklets

Vineis 1993 (*Continued*)

Outcomes	At 2 and 4 years: • Self-reported cessation
Type of intervention	Well-child (child health check)
Notes	Retention: 747/1015 (74%)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	"Non-randomized experimental design"
Allocation concealment (selection bias)	High risk	See above.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Similar follow-up rates in both groups (304/402 intervention, 443/616 control). Participants who had moved away were excluded from analysis
Blinding of outcome assessment (detection bias) All outcomes	High risk	Self-report only; differential misreport possible

Wahlgren 1997

Methods	Country: USA Setting: paediatric allergy medical clinics RCT
Participants	91 families with children with asthma
Interventions	Intervention: Parent and child attended a series of intensive counselling sessions over 6 months designed to reduce child's exposure to parental smoking. Diaries were used in the 2 weeks preceding visits to record parental smoking, child's ETS exposure, child's peak flow readings, and child's symptoms. These data were used for tailored counselling. Control (monitoring): used the same monitoring methods but did not receive counselling Control (usual care): attended clinics at the same frequency but did not maintain records nor receive counselling
Outcomes	At 6 months from end of intervention: • Parent self-report of cigarettes smoked in presence of the child • Air nicotine in room with heaviest child exposure measured by environmental monitor 2 years later: • After debriefing about the study, the 2 comparison groups achieved similar reductions in parent-reported rates of child exposure, and the intervention parent-reported child

Wahlgren 1997 (*Continued*)

	exposure rate was similarly maintained	
Type of intervention	Child with health problems (respiratory disorders)	
Notes		

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	"Randomized"; no further information provided
Allocation concealment (selection bias)	Unclear risk	Not described
Incomplete outcome data (attrition bias) All outcomes	Low risk	High rate of follow-up at 12 months across all groups (28/31 intervention, 28/28 monitoring control, 26/32 usual care)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Self-report validated by environmental monitor

Wakefield 2002

Methods	Country: Australia Setting: recruited from paediatric outpatient clinics, intervention by mail and phone CT: alternation by week of attendance at clinic
Participants	292 smoking parents of children aged 1 to 11 with asthma
Interventions	At baseline, urine analysed for cotinine:creatinine ratio Intervention: parents sent a letter signed by the study co-ordinator to explain child's baseline cotinine:creatinine ratio, and to encourage banning smoking at home. Two booklets enclosed: 1 explained the effects of ETS on children and gave advice to parents on its restriction; the other concerned quitting. The index parent was contacted by telephone 1 week and 1 month later for advice and encouragement. Control: usual advice about smoking from doctors and nurses
Outcomes	At 6 months: • Smoking bans at home Secondary study outcomes: • Parent reports of bans on smoking in car • CPD • Child urinary cotinine • Parent-reported cessation
Type of intervention	Child with health problems (ill-child health care)

Wakefield 2002 (*Continued*)

Notes	Retention 264/292 (90.4%)	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	"Families were allocated by alternate week to either an intervention or control group. "
Allocation concealment (selection bias)	High risk	No information was provided, but method of sequence generation makes allocation concealment highly unlikely
Incomplete outcome data (attrition bias) All outcomes	Low risk	Similar rates lost to follow-up in both groups (10.5% intervention, 8.7% control)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Children's cotinine levels used to validate self-report of smoking bans

Walker 2015

Methods	Country: Australia and New Zealand Setting: community (home) Type: RCT
Participants	293 mothers of infants between birth and 5 weeks of age, when mothers self-identified as Maori or Australian Aboriginal/Torres Strait Islander and mothers were current smokers, or the infant lived in a household with at least 1 smoker
Interventions	Intervention: Mothers (and family members present) received usual care plus behavioural coaching about dangers of SHS exposure to children, commitment to smoking restrictions in the home/car, positive role modelling, and strategies for overcoming obstacles to making smoke-free changes. Smokers also were offered brief advice or intensive counselling to quit and were offered free NRT and/or a quit line referral Control: usual care, which included brief quit advice and the provision of smoking cessation treatment
Outcomes	Child exposure: child urine cotinine, self-report smoking restrictions in home/car, self-reported SHS exposure, and self-reported smoking cessation Child illness: parent-reported cough in child Child health service utilisation: rate of health provider presentations and/or hospitalisations for new primary episodes of acute respiratory illness in the first year of life Target behavioural change: smoking cessation, restriction, and home/car smoking ban
Type of intervention	Community-based

Walker 2015 (*Continued*)

Notes	Conflicts of interest: All authors declare that (1) no trial authors have received support from any companies for the submitted work; (2) CB has previously undertaken research on behalf of NicoNovum, but before the purchase of the company by RJ Reynolds. NW has provided consultancy to the manufacturers of smoking cessation medications, received honoraria for speaking at a research meeting, and received benefits in kind and travel support from a manufacturer of smoking cessation medications MG has provided consultancy to the manufacturers of smoking cessation medications; (3) their spouses, partners, or children have no financial relationships that may be relevant to the submitted work; and (4) all trial authors have no non-financial interests that may be relevant to the submitted work. NW, CB, MG, and VP have also undertaken 2 trials of very low nicotine content cigarettes, which were purchased from 2 different tobacco companies. The companies concerned had no role in development of the study design, data collection, data analysis, data interpretation, or writing of the trial publications Source of funding: National Health and Medical Research Council of Australia (545203); the Health Research Council of NZ (09/626); Cure Kids NZ (3525); and the James Russell Lewis Trust, New Zealand (13787/15734)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomised in a 1:1 ratio to 1 of 2 arms by central computer using block randomisation stratified by country
Allocation concealment (selection bias)	Low risk	Not specified, but allocation was randomised by a central computer
Incomplete outcome data (attrition bias) All outcomes	Low risk	88% follow-up in intervention group and 86% follow-up in control group
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Objective measure and single-blind (research staff assessing the primary outcome were blinded to treatment allocation)

Wang 2015

Methods	Country: China Setting: community (preschools) Type: RCT
Participants	65 caregivers (and children, but this Cochrane Review focuses on caregivers only)
Interventions	Intervention: health education classes for children aimed at encouraging children to persuade their smoker caregivers to change their behaviours. Children were given a book-

Wang 2015 (*Continued*)

	mark, a card, and a sign that said "no smoking" to act as reminders for their caregivers. Also children were given materials about quitting and ETS exposure to be shared with their caregivers. Smoking cessation and ETS exposure counselling for caregivers consisted of 1 lecture and 5 monthly in-person counselling sessions at school over 6 months, together with educational materials and text messages. Child's urine cotinine level was fed back to caregivers Control: Group underwent all assessments but did not receive counselling
Outcomes	Child exposure: child urine cotinine, self-reported ETS exposure of children by caregivers, caregivers' self-reported smoking status Target behavioural change: smoking cessation and reduced smoking in home or in presence of child
Type of intervention	Community-based
Notes	Conflict of interest: none declared Source of funding: Postgraduate Research Fund of Central South University, China (Grant Number 2013zzts076)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Two-stage simple random sampling (first stage: district drawn at random; second stage: preschool drawn at random); unit of randomisation was the individual family; computer-generated randomisation table used
Allocation concealment (selection bias)	Low risk	Randomisation information was kept from the study counsellor until the baseline assessment was completed
Incomplete outcome data (attrition bias) All outcomes	Low risk	No loss to follow-up
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Lab staff blinded to intervention status; cotinine used as an objective measure

Wiggins 2005

Methods	Country: UK Setting: community Type: RCT

Wiggins 2005 (*Continued*)

Participants	731 mothers who lived in deprived London districts and met the inclusion criteria after answering an information leaflet
Interventions	Intervention Group 1: Support Health Visitor intervention consisting of monthly supportive listening visits to the mother's home, beginning when the baby was 10 weeks old. The primary focus was on the mother rather than on her child, as well as on providing practical support and information. Intervention Group 2: Assignment to 1 of 8 community groups that offered service for mothers with children younger than 5 years of age in the study area Control: usual care
Outcomes	Childhood injury, maternal depression, and smoking Uptake and cost of health services, household resources, maternal and child health, experiences of motherhood and infant feeding
Type of intervention	Well-child (peripartum)
Notes	Retention: 601/731

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"The allocation sequence was computer generated and minimisation was used to provide a reasonable balance on three potential confounders..."
Allocation concealment (selection bias)	Low risk	"Recruiters provided a centrally based administrator with the participant's name and information on the minimisation factors. These data were entered into the computer program to determine the participant's allocation."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Similar rates of follow-up at 12 months in all groups (82% control, 85% community group intervention, 80% support health visitor intervention). Intention-to-treat analyses were performed
Blinding of outcome assessment (detection bias) All outcomes	High risk	Self-report via postal questionnaire: "because of the nature of the interventions, it was not possible for either the trial participants or the researchers to be blinded to group allocation"

Wilson 2001

Methods	Country: USA Setting: paediatric pulmonary service of a paediatric hospital RCT
Participants	87 parents of children 3 to 12 years of age with asthma who were ETS exposed. (At baseline, 61% of intervention group maternal caregivers smoked vs 42% of controls.)
Interventions	All children examined at baseline by a paediatric pulmonary specialist, and their treatment was adjusted as appropriate. Intervention: Caregiver received 3 nurse-led sessions over a 5-week period, employing behaviour change strategies and basic asthma and ETS education, along with repeated feedback on the child's urinary cotinine level (measured each session). The child and other family members were sometimes involved. Control: Caregivers received basic asthma advice from a nurse, along with the statement that ETS is to be avoided. Mothers who requested the cotinine result were told whether or not cotinine had been detected
Outcomes	At 12 months: • Urinary cotinine • Acute asthma episodes Secondary study outcomes: • Hospitalisation • Prohibition of smoking in the home • CPD • Parent-reported exposure of children and asthma control
Type of intervention	Child with health problems (respiratory disorders)
Notes	Follow-up cotinine data obtained in 51/87 (59%)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	"Randomization design with blocks of length four"; no further information provided
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Intention-to-treat analysis conducted; "attrition rates on the cotinine data were equivalent in the intervention and control groups" (25/44 intervention, 26/43 control)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical measure used

Wilson 2011

Methods	Country: USA Setting: participants identified from insurer database, counselling intervention delivered in the community RCT
Participants	Caregivers of children aged 3 to 12 years who have asthma and are exposed to second-hand smoke
Interventions	Three counselling visits, including cotinine feedback, and 3 follow-up phone calls
Outcomes	Twelve-month follow-up from baseline: • Child urinary cotinine:creatinine ratio • Child asthma-related use of healthcare resources (asthma visits and medication use) • Home smoking bans • Caregiver smoking status
Type of intervention	Child with health problems (respiratory disorders)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer algorithm used
Allocation concealment (selection bias)	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low loss to follow-up
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Study staff performing follow-up blinded; asthma assessments blinded Biological measure used

Winickoff 2010

Methods	Country: USA Setting: hospital and community Quasi-experimental RCT
Participants	101 mothers and fathers of newborns recruited on the postnatal ward who were current smokers or recent quitters
Interventions	Intervention: A 15-minute counselling session in person, enrolment in a proactive state quit line, follow-up faxes to health professionals with tailored treatment measures Control: usual care

Winickoff 2010 (*Continued*)

Outcomes	3-Month follow-up during which participant enrolment in the state smoking quit line was assessed and self-reported smoking status was taken with a salivary cotinine level as confirmation of a self-reported 7-day point-prevalence cessation
Type of intervention	Well-child (child health check)
Notes	Retention: 75% control and 69% intervention available for follow-up

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	"Participants were assigned to either the control or the intervention condition on the basis of the date the mother was admitted to the postpartum floor."
Allocation concealment (selection bias)	High risk	See above.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No significant difference in follow-up between groups (75% control and 69% intervention); intention-to-treat analysis performed
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used

Woodward 1987

Methods	Country: Australia Setting: maternity hospital CT: allocation by month of delivery
Participants	184 parents of newborn babies whose mothers smoked during pregnancy
Interventions	Intervention: Mothers in the maternity hospital were given an information kit about the effects of ETS on children and ways to quit smoking, along with a letter from the director of the Neonatal Intensive Care Unit urging parents to avoid exposing children to ETS. The kit was given to women by a research worker, who explained the material and answered questions. Women were telephoned at 1 month and were asked about their progress and use of the kit, and were given further information if required. Control and follow-up only: did not receive the above intervention
Outcomes	At 3 months: • Infant urine cotinine levels • Maternal quitting, maternal cotinine

Woodward 1987 (*Continued*)

Type of intervention	Well-child (peripartum)	
Notes	Retention: 157/184 (85%)	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Non-randomised; group assignment by month of admission
Allocation concealment (selection bias)	High risk	See above.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Similar and high rates of follow-up in both groups (54/61 intervention, 57/62 control)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biological validation used

Yilmaz 2006

Methods	Country: Turkey Setting: hospital RCT	
Participants	375 mothers with children attending well-child clinic or with any primary complaint	
Interventions	Intervention 1: smoking cessation intervention aimed at child's health Intervention 2: smoking cessation intervention aimed at mother's health Control: no smoking cessation advice	
Outcomes	Maternal smoking status Smoking location change Postintervention knowledge change	
Type of intervention	Mixed/not stated	
Notes		
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	"Each mother was assigned the number of the questionnaire she filled in... Then the mothers were randomly assigned by a nurse who

Yilmaz 2006 (*Continued*)

		doesn't know anything about the study and the groups to one of three groups by randomly picking numbers form the list of questionnaire/mother numbers."
Allocation concealment (selection bias)	High risk	See above; breaking of allocation concealment possible
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	"12 (out of 375) families could not be contacted and were therefore excluded from the analysis." Unclear which groups those not reached came from.
Blinding of outcome assessment (detection bias) All outcomes	High risk	No biochemical validation used; differential misreport possible

Yucel 2014

Methods	Country: Turkey Setting: community (home and telephone) Type: RCT
Participants	80 mothers of children aged 1 to 5 years who smoked and/or whose spouses smoked
Interventions	Intensive intervention: consisting of 3 home visits, 2 telephone follow-ups, and urine cotinine notification. Initial home visit provided brochures for whole family to read. Five behavioural change techniques were used: (1) providing information, (2) engaging in goal-setting behaviour (not smoking in the home) and outcome (to reduce children's ETS exposure), (3) using follow-up prompts, (4) educating to use prompts (i.e. "no smoking" warning signs in the home), and (5) providing environmental restructuring (i.e. removing ashtrays in the house) Control: minimal intervention comprising 2 home visits and urine cotinine notification
Outcomes	Child exposure: urine cotinine; home smoking ban; number of cigarettes smoked in home Target behavioural change: home smoking ban
Type of intervention	Community-based
Notes	Conflict of interest: none declared Source of funding: Ege University Scientific Research Projects Commission (Project No. 2009 Medicine 037)

Risk of bias

Bias	Authors' judgement	Support for judgement

Yucel 2014 (*Continued*)

Random sequence generation (selection bias)	Unclear risk	Stratified using SAS statistical programme. However, 12 mothers were substituted with other mothers due not wishing to participate, inability to collect child urine, or not meeting the participation criteria. Unclear if this was before or after randomisation
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Low risk	97.5% follow up
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Objective cotinine measure (blinding not specified)

Zakarian 2004

Methods	Country: USA Setting: community RCT	
Participants	150 smoking mothers with children aged 4 or younger	
Interventions	Principal investigator and project co-ordinator met with medical directors from each clinic to plan investigation implementation, then regularly throughout the study to "enlist participation and ongoing support". Intervention: Seven behavioural counselling sessions (3 in-person and 4 over the telephone) over 6 months. Mothers were assisted in developing plans to reshape their and other household members' smoking behaviours. Mothers were asked to use pictorial charts and to self-monitor their smoking and exposure. If participants asked counsellor for help in quitting smoking, they were issued a "Quit Kit" from the American Cancer Society. Control: usual care and 3-, 6-, and 12-month follow-up measures	
Outcomes	Mother report of smoking status and child's exposure to ETS Child urinary cotinine concentrations Air nicotine monitors	
Type of intervention	Well-child (child health check)	
Notes	Retention: 128/150 (85%)	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**

Zakarian 2004 (*Continued*)

Random sequence generation (selection bias)	Unclear risk	"Assignment was stratified by child's age, ethnicity, gender, and clinic site. Random number lists were generated for each strata. "
Allocation concealment (selection bias)	Low risk	"Within each group of four numbers corresponding to four participants in that strata, the first two even numbers were assigned to the experimental group."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Intention-to-treat analyses: "mothers who were lost to follow-up and not measured were counted as smokers" 68/74 control and 60/76 intervention reached at final follow-up
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Biochemical validation used "Research assistants who obtained measurements were blind to group assignment, and control families were unaware of counselling procedures."

Zhang 1993

Methods	Country: China Setting: school CT; schools in 1 district received intervention, compared with schools in a second district	
Participants	20,382 children in 44 primary schools 68.8% of intervention and 65.5% of control fathers smoked at baseline	
Interventions	Intervention: A tobacco prevention curriculum comprising social and health consequences of tobacco use and training in refusal skills was introduced. Smoking control policies for schools were encouraged. Children in intervention schools wrote letters to their fathers to ask them to quit smoking and monitored their smoking behaviour. Control: usual curriculum	
Outcomes	At 8 months: • Self-report of smoking cessation by smoking fathers during interview with health educator	
Type of intervention	Community-based	
Notes		
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**

Zhang 1993 (*Continued*)

Random sequence generation (selection bias)	High risk	No randomisation reported
Allocation concealment (selection bias)	High risk	See above.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No information on missing data reported
Blinding of outcome assessment (detection bias) All outcomes	High risk	Self-report only; differential misreport possible

5 As: Ask, Advise, Assess, Assist, Arrange.
BAM: Behavioural Action Model.
CBFRS: Community-Based Family Resource and Support.
CHG: Child's Health Group.
CO: carbon monoxide.
CPD: cigarettes per day.
CT: controlled trial.
EPA: Environmental Protection Agency.
ETS: environmental tobacco smoke.
FeNO: fractional exhaled nitric oxide.
GP; general practitioner.
IgE: immunoglobulin E.
ITT: intention-to-treat.
MHG: Mother's Health Group.
MI: motivational interviewing.
min: minute(s).
NICU: neonatal intensive care unit.
NIH: National Institutes of Health.
NRT: nicotine replacement therapy.
PAM: Precaution Adoption Model.
RCT: randomised controlled trial.
Rint: interrupter resistance measurement.
SHI: smoking hygiene intervention.
SHS: second-hand smoke.
SPSS: Statistical Package for the Social Sciences.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Arborelius 2001	Longitudinal study
Bacewicz 2015	Wrong study design (no control group)
Badger 2003	Conference abstract only. Trial authors contacted and no further study information provided
Burmaz 2007	Minimal data on smoking at either baseline or follow-up, as smoking only a very small component of the intervention
Campion 1994	Outcomes assessed by 2 surveys carried out before and after the campaign. This study targeted pregnant women
Carlsson 2013	Wrong study design (no control group)
Chamberlain 2013	Wrong study design
Cookson 2000	Before-and-after study
Eakin 2013	Abstract only; full paper included
Emmons 2000	Quasi-experimental historical comparison design.
Gadomski 2011	Uncontrolled study; no outcome data for control; only 3 versions of the intervention
Halterman 2011a	Conference presentation only
Hovell 2011	Intervention aimed at preteens themselves, not at families or carers
Huang 2013	Wrong outcomes
Hutchinson 2014	Abstract only
Kegler 2012	Pre-post study; not a controlled study
Klinnert 2007	Does not include outcome data related to ETS.
Lepore 2013	Study protocol only
Loke 2005	Intervention targeted pregnant women and their non-smoking spouses during the perinatal period only
Manfredi 1999	This study targeted predominantly women, some of whom were mothers
Meltzer 1993	Multiple-baseline, quasi-experimental design

(*Continued*)

Morgan 2004	Does not include outcome data related to ETS.
Murray 1993	Longitudinal study
Oien 2008	Study objective to assess the impact of an intervention on parental smoking during pregnancy
Okah 2003	Secondary analysis of an RCT of bupropion for smoking cessation
Philips 1990	Met main inclusion criteria, but the outcome measure was the report by kindergarten students of their intent to avoid cigarette smoke (by leaving the room themselves or asking an adult smoker to stop smoking). This outcome measure is believed by trial authors to be too unreliable for inclusion of this study
Sockrider 2003	No ETS results published; this was an ongoing study from 2003 in the previous version of this Cochrane review (Baxi 2014); email contact with trial authors, no response
Spencer 2000	Pilot study only. No further results available.
Stepans 2006	Pilot study only
Stotts 2013b	Study protocol only; full paper included
Tingen 2016	Abstract only
Turner-Henson 2005	Intervention not described
Walley 2015	Wrong study design (no control group)
Williams 2016	Wrong patient population
Wilson 1996	Baseline results only
Wilson 2005	This ongoing study from 2005 was included in the previous version of this Cochrane Review (Baxi 2014); email contact with trial authors; no response
Winickoff 2013	Outcome data related to ETS not included, but data related to implementation of an intervention provided

ETS: environmental tobacco smoke.
RCT: randomised controlled trial.

Characteristics of ongoing studies *[ordered by year of study]*

Johnston 2010

Trial name or title	The study protocol for a randomised controlled trial of a family-centred tobacco control programme about environmental tobacco smoke (ETS) to reduce respiratory illness in Indigenous infants
Methods	Parallel RCT
Participants	Indigenous women from Australia and New Zealand and their infants recruited from birth to 5 weeks age and followed-up until 12 months of age, when the mother herself smokes or someone else in the household is a smoker
Interventions	Face-to-face home visits. Indigenous model of health promotion - information provision, health education, behavioural coaching for women. For other smokers in the household - smoking cessation advice, counselling, and treatment options
Outcomes	Infant medically attended acute respiratory illness Hospitalisations for infant acute respiratory illness Infant urinary cotinine Carer's self-report of infant tobacco smoke exposure Carer's report of home and car smoking bans Carer's self-report of smoking cessation Carer's self-report of number of quit attempts Process indicators
Starting date	2009
Contact information	Vanessa Johnston
Notes	Dr. Johnston contacted on 28 June 2017, but no response. Study results not yet published

Rosen 2011

Trial name or title	Project zero exposure
Methods	Three-stage approach: Stage 1 is intervention development, stage 2 is intervention pilot, and stage 3 is a cluster RCT
Participants	Parents who smoke with a child younger than 3 years of age
Interventions	Developing a theory-based intervention based on social marketing - try to convince to stop smoking, (or) stop smoking around the child. Will have group support sessions, feedback of biochemical result of child tobacco smoke exposure, project website, video simulation game, and study information given to the participant's physician
Outcomes	Child tobacco smoke exposure assessed by hair nicotine Parental report of child tobacco smoke exposure Adoption of voluntary home and car smoking bans

Rosen 2011 (*Continued*)

	Child respiratory symptoms Parental smoking cessation
Starting date	Unclear
Contact information	Dr. L. J. Rosen
Notes	Dr. Rosen contacted on 28 June 2017; study results not yet available

Wagener 2012

Trial name or title	Novel methods to reduce children's secondhand smoke exposure I
Methods	RCT
Participants	Carers of children (3 to 11 years of age) who smoke and who are not interested in quitting
Interventions	Three arms: Participants receive electronic cigarettes, dissolvable tobacco lozenges, or dissolvable nicotine lozenges (Nicorette) for use instead of cigarettes when in the presence of their child(ren) for up to 8 weeks
Outcomes	Primary outcome measures: • Change in child salivary cotinine [Time Frame: 2, 4, 8, and 12 weeks] • Child salivary cotinine measured to assess the level of second-hand smoke exposure. We will measure the change throughout the study. Secondary outcome measures: • Change in parent and child lung function [Time Frame: 2, 4, 8, and 12 weeks]. We will collect both parent and child spirometry data and will compare changes
Starting date	April 2012
Contact information	Theodore L. Wagener; theodore-wagener@ouhsc.edu
Notes	Contacted trial author; currently analysing data; no published manuscripts yet

Hutchinson 2013

Trial name or title	PREPASE (PREvent PAssive Smoke Exposure)
Methods	RCT
Participants	Families with children (birth to 13 years of age) having an asthma predisposition who experience passive smoke exposure at home
Interventions	A motivational interviewing tailored programme including urinary cotinine feedback with 6 sessions; based on the principles of the reasoned action model

Hutchinson 2013 (*Continued*)

Outcomes	Primary outcome measure: • Percentage of families curtailing passive smoking exposure in children (parental report verified with urine cotinine concentrations of children) after 6 months Secondary outcome measures: • Household nicotine level • Child's lung function, airway inflammation and oxidative stress, presence of wheezing and questionnaires on respiratory symptoms, and quality of life
Starting date	Unclear
Contact information	On paper: contact via Sasha Hutchinson
Notes	Dr. Hutchinson contacted on 28 June 2017; no response

Risica 2016

Trial name or title	Baby's Breath
Methods	RCT
Participants	Pregnant women (not more than 16 weeks pregnant; spoke English and at least 18 years old) who are smokers, spontaneous quitters (women who quit on their own without project materials) or smoke-exposed, not pregnant with more than 1 baby, and have access to a working telephone and VCR/DVD player
Interventions	A series of 5 tailored videos and newsletters addressing issues of tobacco smoke avoidance, including smoking cessation, were compared with written materials containing no tobacco-related content
Outcomes	The primary outcome measure is foetal exposure to ETS during pregnancy and in the infant at 6 months of life (salivary cotinine and self-report). Other impact measures included were psychosocial variables used to assess possible determinants of ETS. Self-reported outcomes and most impact variables were assessed at 16 and 32 weeks of pregnancy, and at 3 and 6 months postpartum
Starting date	Unclear
Contact information	Patricia Risica; Patricia_risica@brown.edu
Notes	Dr. Risica contacted on 28 June 2017; no response

ETS: environmental tobacco smoke.
RCT: randomised controlled trial.

DATA AND ANALYSES

Comparison 1. Results

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Main outcomes			Other data	No numeric data

Analysis 1.1. Comparison 1 Results, Outcome 1 Main outcomes.

Main outcomes

Study	
Abdullah 2005	Counselling strategies based on the stages of change component of Prochaska's transtheoretical model. Results as N (%), intervention N = 444, control N = 459. Biochemically validated quit rate: Intervention 47 (10.6) Control 21 (4.5) Had not quit but had reduced intake: Intervention 145 (32.6) Control 83 (18.1) Stopped smoking for at least 24 hours: Intervention 145 (32.7) Control 136 (29.7) Complete restriction: Intervention 113 (24.6) Control 151 (34.1) Partial restriction: Intervention 278 (62.7) Control 259 (56.4) No measure of children's exposure or absorption via cotinine
Abdullah 2015	ETS exposure: 6 month follow-up: 1) higher proportion of the intervention (62%) than the comparison (45%) group households adopted complete smoking restrictions at home (P = 0.022); 2) higher proportion of the intervention (38%) than the comparison (17%) group households did not smoke at home at all (P = 0.002); 3) total exposure from household members inside home in the past 7 days (measured by mean number of cigarettes smoked per week in front of the child by household members) was lower in the intervention (3.29) than the comparison (7.41) group (P = 0.021); 4) total exposure from all smokers indoors and outdoors in the past 7 days (measured by mean number of cigarettes smoked per week in front of the child) was significantly lower among children in the intervention (15.2) than the comparison (25.7) group (P = 0.005); 5) Comparison group: mean cotinine levels increased from baseline to 2 months and maximum at 6 months, with no statistically significant difference in time effects. Intervention group: mean cotinine levels increased at 2 months from baseline level but decreased again at 6 months, with statistically significant difference in time effects only from 2 to 6 months (P < 0.05); 6) No significant difference in allowing others to smoke around the child (P = 0.908) Air quality: At 6 month follow-up: 1) mean number of cigarettes smoked daily was significantly lower in the intervention (11.02) than the comparison (13.6) group (P = 0.021); 2) significantly more participants in the intervention (48%) than the comparison (28%) group reduced the number of cigarettes smoked at home daily (P = 0.006) Child health: Perceived overall respiratory health of the child improved significantly in the intervention (35%) than the comparison (20%) group (P = 0.024). There were no significant differences in the reports respiratory symptoms of the child (P = 0.258)
Armstrong 2000	Targeted disadvantaged mothers. Smoking in house around infant (maternal self report verified by researcher observation during home visit) Intervention 8.6% v Control 23.8% (P < 0.05). included education about smoking near infants as a Sudden Infant Death Syndrome (SIDS) prevention strategy

Main outcomes (*Continued*)

	in a post-natal nurse home visiting programme aimed to improve the quality of maternal-child attachment, maternal health and child health parameters. At four months the intervention group had significantly more completed immunizations than the controls, although both groups had high immunization rates. At 12 months there was no statistically significant difference between the groups for immunization status. There was also no significant difference at four or 12 months for rates of utilisation of community services
Baheiraei 2011	Motivational Interviewing used. In 3 months geometric mean urinary cotinine: intervention decreased from 48.72 ng/mg to 28.68 ng/mg, control decreased from 40.43 to 36.32 ng/mg, differences between two groups statistically significant using one tailed t-test Greater decrease in total daily cigarette consumption in the presence of child in the intervention group than the control group (statistically significant with one tailed t-test) Intervention median cigarettes at 3 month 0 (IQR 1 to 2.71), control 1 (IQR 0 to 3.21) Home smoking bans: intervention 15% to 33.3% (statistically significant increase), control 11.5% to 19.5% (not statistically significant increase), differences between two groups statistically significant using a one tailed t-test Car smoking bans in the intervention group increased from 4% to 8%, and didn't change in the control group. This was not a statistically significant difference
Blaakman 2015	ETS exposure: 5 months after discharge from NICY, caregivers in treatment group were sig more likely to report a home smoking ban than the comparison group (96% vs 84%; P = 0.03), and less likely to report routine infant contact with a smoker (40% vs 58%, P = 0.03). Differences in reported home bans (92% vs 83%, P = 0.14) and routine infant contact with smokers (44% vs 53%, P = 0.33) were no longer significantly different at study end (8 months after NICU discharge). No difference in car smoking bans or total smoking bans at any time. 8 months after NICU discharge, infants in intervention group had lower salivary cotinine and a greater decrease in salivary cotinine since baseline than infants in the comparison group Air quality: Overall, very few caregivers quit smoking, which didn't differ between groups after intervention or at study end. Of the 29 total caregivers who reported smoking 5 months after NICU discharge, caregivers in the intervention group reported significantly higher confidence to quit than smoking caregivers in the comparison group at the 5-month survey, but not at study end. No significant difference between groups in caregiver motivation to quit Child health: No significant differences between groups in respiratory symptoms or use of health care services
Borrelli 2010	Latino families targeted. Used two interventions with different theoretical frameworks: one intervention used motivational interviewing, whilst the other intervention used the social cognitive theory. At 3 months 61.7% home monitors were returned and 98.8% were in good condition, whilst 60.9% child monitors returned and 100% in good condition. Household air nicotine significantly decreased from pretreatment to the 3 month follow-up in the BAM condition, (baseline M = 1.07, SE 0.19, and 3-month M = 0.28, SE 0.11, P = 0.01), whereas the decrease observed in the PAM condition was not statistically significant. Changes in secondhand smoke concentrations as assessed by the child monitors were not statistically significant Continuous abstinence at 3 months 12.3% BAM group and 19.1% PAM group (OR 1.68, 95% CI 0.64 to 4.37) The child's level of functional morbidity due to asthma decreased significantly (P < 0.001) in both groups over time Secondhand smoke exposure as measured by monitors directly on the child did not show a significant decrease in either group

Main outcomes (*Continued*)

Borrelli 2016	ETS exposure: SELF-REPORTED: 1) PAM had significant reductions over time on one SHS exp variable, while HC had reductions on 4 of the 5 SHS exp variables, with a significant group x time interaction. 2) Enhanced PAM showed sig within-group decreases in SHS exp over time on all 5 variables and HC showed sig within group decreases in SHS exp over time on 4 of the 5. Sig group x time interaction, such that enhanced PAM showed greater decreases in SHS exp over time versus HC for 3 of the 5 SHS exp variables; 3) Comparing PAM with enhanced PAM, no significant group x time interaction. OBJECTIVE: 1) No significant differences in levels of SHS exp at baseline; 2) At follow-up, there were significant differences in detectable levels of SHS exp in the HOME monitors (PAM 92.1% vs HC 97.2%, P = 0.04), but NOT the CHILD monitors (PAM 91.4% vs HC 95.6%); 3) At follow up, no significant between-group differences in detectable levels of SHS exp in either the home or child monitors, when comparing PAM with enhanced PAM Air quality: 1) PAM more than 2x as likely to achieve 7-day and 30-day point-prevalence abstinence than HC (statistically significant); 2) Enhanced PAM more than 2x as likely to achieve 7-day PPA, 3x as likely to achieve 30-day PPA than HCs, and 5x as likely to be continuously abstinent than HCs (statistically significant); 3) At 4-months, enhanced PAm were more than 2x as likely to achieve 30-day PPA versus PAM (significant) Child health: 1) At 6-months, enhanced PAM had significantly lower child asthma hospitalisations than PAM; 2) At 2, 4 and 6 month follow-up, enhanced PAM had sig lower missed school days due to asthma than PAM; 3) Odds of at least 1 day with asthma symptoms was sig lower in enhanced PAM than PAM at 6-months; 3) No sig diff between groups in changes in asthma functional morbidity
Butz 2011	Low income households targeted. No statistically significant differences in urinary cotinine between baseline and follow up by group After combining the air cleaner groups, children assigned to those groups had a significant increase in symptom-free days (SFDs) during the past 2 weeks (1.36 SFDs) compared with 0.24 SFDs for control group children from baseline to follow-up No statistically significant differences In air nicotine at baseline and follow-up by group Comparison of the combined air cleaner groups and the control group indicated that the combined air cleaner groups had significant mean differences in PM2.5 and PM2.5-10 levels from baseline to follow-up (mean differences for PM2.5: control, 3.5 [SD, 20.0]; combined air cleaner groups, -18.0 [SD, 33.2; P 0.001]; and for PM2.5-10: control, 2.4 [SD, 20.8]; combined air cleaner groups, -9.6 [SD, 16.0; P = 0.009])
Chan 2005	Motivational Interviewing used. No statistically significant evidence of effect. Quit rate at 1 month post intervention: Intervention 7.5% [95%CI: 0 to 21] v 2.5% [95% CI: 0 to 7] control NS Reduced smoking consumption by half (self report): Intervention: 15% Control: 10% NS Reported quit attempts in last 30 days: Intervention 20% Control 7.5% NS Moved up the stage of readiness to quit: Intervention 17.5% Control 10% NS
Chan 2006a	Fishbein's theory of reasoned action and Ajzen's theory of planned behaviour used in the development of the educational intervention Three most frequently reported actions taken by the mother to protect the child from passive smoking at home: opening the windows (N = 641, 43.9%), asking the father not to smoke near the child (N = 608, 41.6%), and moving the child away from the smoke (N = 482, 33%). Moved the children away when they were exposed to the fathers' smoke at home at 3-month follow up (78. 4% vs. 71.1%; P = 0.01) NS at 6 and 12 months. Number of smokers (excluding the father) living with the child at 12 month follow up (11% vs 13% P = 0. 049)

Main outcomes (*Continued*)

	Smokers who smoked at home (Excluding Child's Father), at 12-month follow up (92% vs 93% NS) Child's ETS exposure at home by any smoker 3 months Intervention 37% vs Control 42% (P = 0.02) 6mths 51% vs 53% P = 0.48 12 mths 52% vs 58% P = 0.03
Chellini 2013	Post-intervention smoke free homes were not significantly different between groups (increased in both): percentage increase in intervention group 12.7% and control group 11.1% (OR 1.04, 95 CI 0.47 to 2.28) For cars: intervention group 18.2%, and control group 12.0% (OR 1.47 95 CI 0.69 to 3.11. Of the N = 131 smokers there was no significant difference in change of smoking habits. between intervention and control group (7% total stopped smoking, 5% stopped smoking indoors and n = 9 stopped smoking in the car)
Chen 2016	ETS exposure: After intervention, the percentage of children with a urine cotinine concentration higher than 6ng/ml (indicating exposure) in the intervention group was significantly lower than that in the control group at both 8 weeks (P < 0.0001) and 6 months (P = 0.007) Air quality: Significantly less smoking in presence of children in intervention group at both 8 weeks and 6 months Child health: N/A
Chilmonczyk 1992	No evidence of effect. Intervention: 27/52 provided follow-up urine. Control 29/51 provided follow-up urine. Mean log urinary cotinine difference x100: Intervention group 2.05, control 2.17. P = 0.26
Collins 2015	ETS exposure: Associated with lower child urine cotinine compared with the control group Air quality: Twenty (18.3%) of intervention group mothers and three (1.9%) of the control group mothers had bioverified quit status) P < 0.01) Child health: N/A
Conway 2004	Participants (Latino families) for this study were recruited through advertising at community organisations and venues. Social learning model used. No significant effect. Hair nicotine (log ng/mg) 3mth Intervention 0.28, Control 0.32;12 mth Intervention 0.23, Control0.23 NS Hair cotinine (log ng/mg) 3mth Intervention 0.04, Control 0.04;12 mth Intervention 0.02, Control 0.04 NS Parent report reduction: % confirmed reducers 3mth Intervention 52%, Control 46%; 12mth Intervention 61%, Control 56% NS
Cooper 2014	ETS exposure: N/A Air quality: After delivery, there were no statistically significant differences in cessation; self-reported abstinence at 2 years was 2.9% in the NRT group and 1.7% in the placebo group. However, few participants reported using a full 8-week course of NRT; 7.2% in NRT group and 2.8% in placebo group used their trial medications for over 1 month Child health: At birth, significantly more Caesarian births occurred in the NRT group (20.7% vs 15.3%); at 2 years, significantly more infants in the NRT group (72.6% vs 65.5%) survived with 'no impairment'; 3) However, no sig difference between groups in infants' reported respiratory problems

Main outcomes (*Continued*)

Culp 2007	At 12 months the intervention group smokers smoked mean 2.1 fewer than control, which was not statistically significant: intervention 7.28 (s.d. 6.79), control 9.41 (s.d. 7.09) (t(147) = 1.82, P = 0.071) There were no significant differences between groups on number of hospital admissions or emergency room visits. At 12 months, intervention mothers were more likely to make use of health department clinics for well child care as compared to control group (chi square P =0.04) Knowledge of secondhand smoke exposure on child development: at 12 months significantly more intervention (N = 90, 58.1%) than control (N = 51, 47.7%) knew about SHS and impaired brain development, and significantly more intervention (N = 126, 80.6%) than control (N = 77, 72.0%) knew it takes longer to get well. No other significant differences with questions
Curry 2003	Ethnically diverse low income women targeted. Motivational Interviewing used. Abstinence rates: 3 mth Intervention 7.7% vs Control 3.4%; 12mth Intervention 13.5% vs Control 6.9% - 12 mth difference statistically significant. Serious attempt to quit at 12 months Adjusted OR 1.53 (95% CI 0.96 to 2.44) Ever quit for 24h at 12 months Adjusted OR 0.94 (95% CI 0.59 to 1.5) Prevalent abstinence 3 months Adjusted OR 2.40 (95% CI 0.85 to 7.8) 12 months Adjusted OR 2.77 (95% CI 1.24 to 6.60) Sustained abstinence (abstinent at 3 and 12 months) Adjusted OR 1.83 (95% CI 0.29 to 14.30) Validation of smoking cessation by carbon monoxide expiration was completed by only a small subsample (13/156 in the intervention group and 5/147 in the control group)
Daly 2016	ETS exposure: At 12 month follow-up, 13% of all infants were reported to be exposed to SHS; however with urine cotinine validation, 17% overall were exposed. No significant time by group difference detected from baseline to follow-up for either of the 2 treatment arms when compared with the control group Air quality: At follow-up, 47% of all parent/carers reported they were smokers. No significant time by group differences detected comparing either treatment arm with the control group Child health: N/A
Davis 1992	This study recruited participants through an advertising campaign that invited them to call a telephone smoking cessation assistance counselling service run by the National Cancer Institute in the USA. No evidence of difference between self-help guides. Self-reported quit attempts: Guide 1 121/198 (61%), Guide 2 122/204 (60%), Guide 3 147/229 (64%); Self-reported abstinence for last week: Guide 1 28/198 (14%), Guide 2 24/204 (12%), Guide 3 27/229 (12%) P > 0.05
Eakin 2014	ETS exposure: Differences in salivary cotinine were not significant. However, among all families who reported a home smoking ban, salivary cotinine and air nicotine levels declined in both groups (P < 0.05) Air quality: Participants in the MI and education group had significantly lower air nicotine levels (0.29 vs 0.40 mg), 17% increase in prevalence of caregiver-reported home smoking bans, and a 13% decrease in caregiver smokers compared with education-alone group (all P values < 0.05) Child health:

Main outcomes (*Continued*)

	N/A
Ekerbicer 2007	This study from Turkey recruited ETS exposed children from a primary school. Parents of identified children received telephone counselling or a note regarding their child's urinary cotinine result. At 9 months follow-up: Group one 74/93 students had urinary cotinine levels < 10 ng/ml; group two 69/93 had urinary cotinine < 10 ng/ml. "The proportion of children with urinary cotinine values < 10ng/ml were statistically similar (P > 0.05) in both groups"
Elder 1996	Social learning model used. No evidence of effect on tobacco-free school policy after 3 years: Intervention 78% of 56 schools, Control 75% of 40 schools
Emmons 2001	Motivational Interviewing used. Quit rates: Intervention 7.5%, Control 10.1%, P > 0.05 CPD: no effect Kitchen and TV room air nicotine measured by passive sampling diffusion monitors at 6 months (log transformed units): Intervention 3.7 & 3.1 fell to 2.6 & 2.3, Control 3.0 & 3.5 changed to 6.9 & 3.5. * P < 0.05,
Eriksen 1996	No evidence of effect. Quit smoking: Intervention 7/222 (3%) vs Control 1/221 (0.5%); Stopped indoor smoking 4/222 vs 4/221; Any positive change 32/222 (14%) vs 34/221 (15%)
Fossum 2004	Social learning model used. Self-reported smoking (number of cigarettes) 1 month before childbirth: Intervention 13.1 vs Control 10.8 NS; 3 months after childbirth Intervention 12.8 vs Control 8.2 (significant); Past 24 hrs Intervention 11.8 vs Control 7.8 (significant). Salivary cotinine: Mean for Intervention reduced from 185 ng/ml to 165; mean for Control increased from 245 to 346 ng/ml. Weak correlation between mother's reported rate of smoking and cotinine levels for both control and intervention groups
French 2007	Six month follow-up data Saliva cotinine verified non smoker: intervention (N = 26, 22%), control (N = 9, 10%) - P < 0.025 Self-reported non-smoker: intervention (N = 40, 33%), control (N = 21, 22%) - P < 0.10
Greenberg 1994	Social learning model used. Targeted ETS exposure in infants less than six months of age, and aimed to reduce the incidence of lower respiratory tract illness and the prevalence of respiratory symptoms. For infants of smoking mothers it demonstrated a lower prevalence of persistent symptoms in the intervention group (17.8%) compared with control group (30.9%; risk difference 13.1%; 95% CI: 1.0 to 27.0%). There was no difference in the incidence of illness. Parents report significant reduction in number of CPD: Intervention 12.5 CPD pre vs 7.7 CPD at 12month follow up, Control 12.3 CPD pre vs 13.3 at follow up P=0.01. Child urinary cotinine does not support this. Baseline mean urinary cotinine/ creatinine (nmol/mmol) Intervention 66 vs Control 51; at follow up Intervention 107 vs 98 Control. P = NS Prevalence of persistent lower respiratory symptoms Intervention 17.8%, Control 30.9% [difference 13.1%, 95% CI -1.0 to 27.0]

Main outcomes (*Continued*)

Groner 2000	No evidence of effect. Self-reported quit rates: Intervention Child Health Group 7/153, Mother's Health Group 4/164, Control 7/162. P = NS Self-reported CPD reduced in all groups; Self-reported not smoking indoors reduced: Intervention CHG 24, MHG 12, Control 13. P < 0.05
Hafkamp-de 2014	ETS exposure: No significant difference in ETS exposure at home between intervention and control groups at age 6 years in the intention to treat analyses (OR 0.82, 95% CI: 0.66, 1.03); though this reached statistical significance in per-protocol analysis with intervention group having less ETS exposure at age 6 years than the control group (OR 0.71, 95% CI: 0.59, 0.87). No effect modification by sociodemographic characteristics (data not shown) Air quality: N/A Child health: No significant differences between groups in asthma, wheezing frequency, airway inflammation (exhaled NO), or airway resistance (Rint)
Halterman 2011	Motivational Interviewing used. Symptom-free days/2 wk (difference) 0.96 (95% CI 0.39 to 1.52) Symptom nights/2 wk (difference) −0.63 (95% CI −1.09 to −0.18) Days with activity limitation/2 wk (difference) −0.44 (95% CI −0.87 to −0.02) Days with rescue medication use/2 wk (difference) −1.04 (95% CI −1.51 to −0.56) Days absent due to asthma/2 wk (difference) −0.22 (95% CI−0.36 to −0.07) ≥1 Visit for acute exacerbation of asthma (RR) 0.55 (95% CI 0.26 to 1.15)
Hannover 2009	Motivational Interviewing used. At 24 months follow-up Sustained abstinence: intervention (N = 36, 12%, 95% CI 8.8 to16.2), control (N = 39, 11%, 95% CI 8.4 to15.1), no statistically significant difference in proportions (0.7, 95% CI -4.2 to 5.8) Four week point prevalence: intervention (N = 72, 24% 95% CI 19.6 to29.2), control (N = 67, 19%, 95% CI 15.6 to23.9), no statically significant difference in proportions (4.7, 95 CI -1.7 to 11.1)
Harutyunyan 2013	ETS exposure: Adjusting for baseline hair nicotine concentration, child's age and gender, the follow-up geometric mean hair nicotine concentration in the intervention group was 17% lower than the control group (P = 0.239). The GM of hair nicotine in the intervention group significantly decreased from 0.30 ng/mg to 0.23 ng/mg (P = 0.024), but not in the control group. Adjusted odds of children's less than daily exposure to SHS at follow-up was 1.87 times higher in the intervention group than in the control group (P = 0.077) Air quality: According to mothers, 4.5% intervention households and 5.4% control households completely banned indoor smoking at follow-up. Also 4.5% smokers in the intervention group and 0.9% in the control group have reportedly stopped smoking at follow-up Child health: N/A
Herbert 2011	Recruited families to participate in the study through five public health nursing offices, eight daycare centres, and kindergartens on Prince Edward Island. Used a family-centred assessment and intervention model to empower families to reduce cigarettes smoked in the home. Those identified as having children exposed to ETS were then invited to participate in group counselling sessions. Intervention: decrease from median of 17 to 4.5

Main outcomes (*Continued*)

	cigarettes/day and Control: decrease from 18.5 to 3.5 cigarettes/day. Both decreases statistically significant so did not detect a beneficial effect of the intervention. At 6 months follow-up intervention participants smoked 0.65 (95% CI -5.68 to 6.98) more cigarettes per day compared to control participants
Hovell 2000	Reduction in parent-reported child exposure to cigarettes in the home and in total. At home reported exposure Intervention baseline 3.9 CPD, follow up 0.52 CPD vs Control 3.51 CPD baseline, 1.20 CPD follow up. The trend for parent-reported total CPD exposure was similar. Reports not supported by child urinary cotinine concentrations (ng/ml). Intervention baseline 10.93, follow up 10.47 vs Control baseline 9.43, follow up 17.47; 56% reduction (95% CI 48 to 63) Achieved a reduction in the number of parent-reported cigarettes smoked in the presence of children per day at 12 months, following a three-month intensive counselling intervention. There was, however, no change in cigarette smoke absorption as measured by children's urinary cotinine (ng/ml) for the intervention group over the 12 months (with measures collected at 3, 6 and 12 months). Cigarette smoke absorption for the control group increased from 9.4 ng/ml to 17.5 ng/ml over this time period, whereas there was almost no change in the intervention group (10.9 at baseline and 10.5 at 12 months). This increase in absorption observed for children in the control group appears to account for the apparent benefit of the intervention group. However the argument that this is solely due to reduced exposure in the home is uncertain, as the mothers in both the intervention and control groups reported falls in mothers' cigarettes smoked in the presence of the child from 3.9 to 0.5 (intervention) and 3.5 to 1.2 (control) cigarettes per day. In addition, they reported falls in total exposure to any source of cigarettes per day from 7.3 to 1.2 (intervention) and 7.2 to 2.8 (control). As the cotinine indicates a minimal fall for the intervention group and almost a doubling in urinary cotinine for the control group, either the cotinine measurement is unreliable or, more probably, that the parental report of cigarette exposure is not reliable
Hovell 2002	Latino families targeted. No significant effect. Decline in reported ETS exposure from (Intervention) 97% to 52% vs (Control) 93% to 69% at end of intervention (month 4). At follow up month 13, 9 months post-intervention (Intervention) 52% to 45% and (Control) 69% to 54%. Average parent-reported exposure levels declined over the follow-up period from 0.57 to 0.47 CPD (Intervention) and 1.11 to 0.71 CPD (Control). These results show a difference of mean 0.34 CPD reduction in exposure by report. Biological verification of child exposure reveals a less successful outcome. Child cotinine levels fell in the intervention group immediately post-intervention (month 4) 1.44 to 1.19 ng/mL, and rose in control group 1.17 to 1.35 ng/mL. Between end of intervention and follow up 9 months later levels fell 1.19 to 0.97 ng/mL (intervention) and 1.35 to 0.86 ng/mL (control). There was no significant difference in the mothers' rate of smoking cessation between groups
Hovell 2009	Low income households targeted. Behavioural ecological model used for development of the counselling intervention. Children's total SHSe showed a significant group by linear time interaction (P = 0.012) and a linear time effect (P < 0.001) from baseline to 6 months. Children's urinary cotinine showed no significant difference. Exposure from mothers in home (reported cigarettes/week) intervention 1.93 (95% CI 0.92 to3.48) control 6.16 (95% CI 3.61 to10.12); total reported exposure (cigarettes/week) intervention 5.15 (95% CI 2. 71 to9.17) control 22.97 (95% CI 15.14 to34.58); mothers smoking reported cigarettes/week intervention 77. 91 (95% CI 64.22 to91.60) control 92.88 (95% CI 80.59 to105.16); reported smoking by mothers indoors at home (cigarettes/week) intervention 3.94 (95% CI 2.06 to6.97) control 10.37 (95 CI 6.16 to17.06); reported smoking by all indoors at home (cigarettes/week) intervention 6.46 (95% CI 3.16 to12.40) control 19.18 (95% CI 11.15 to32.52) Children's urinary cotinine concentration and mother's reported smoking showed a significant group main effect, but did not show a significant difference in rates between intervention and control groups at 18 months

Main outcomes (*Continued*)

Hughes 1991	Intervention to reduce children's ETS exposure in a study of a comprehensive asthma education intervention. The outcome was improved asthma control but no change in exposure to ETS. No evidence of effect on homes with smoker: Intervention baseline 60% of 47 homes, follow up 52% vs Control baseline 57% of 48 homes, follow up 51% P = NS
Irvine 1999	No evidence of effect. Mean decrease in child salivary cotinine (ng/ml): Intervention 0.70 vs Control 0.88. Difference= 0.19, 95% CI -0.86 to 0.48 Mean increase in mothers' salivary cotinine (ng/ml): Intervention 3.1 vs Control 1.8. Difference= 1.3, 95% CI -26.4 to 23.9 Self-reported quit attempts: Intervention 101/213 vs Control 97/222, P = NS
Joseph 2014	ETS exposure: Little change in household or car rules about smoking 8 weeks after index visit, but parents reported a high rate of total restriction at baseline Air quality: 8 weeks after index visit, 11 of 38 (29%) parents in the intervention group reported 7-day point-prevalent abstinence. In contrast, only one parent in the comparison group reported abstinence from smoking (P = 0. 001). There were fewer quit attempts and less readiness to quit in the comparison group Child health: Not reported
Kallio 2006	At child 8 years of age 10.1% (29/287) of mothers and 19.7% (43/218) fathers in the intervention group smoked regularly. The corresponding %s for the control group were 15.1% (45/298) mothers and 25.1% (60/ 239) fathers. Additionally 5.9% (17/287) of intervention group mothers and 8.3% (18/218) of intervention group fathers smoked occasionally compared with 5.7% (17/298) of control group mothers and 6.7% (16/ 239) of control group fathers (NS)
Kegler 2015	ETS exposure: Significantly more intervention participants reported a full ban on smoking in the home than control participants at both 3 months (30.4% vs 14.9%, P < 0.001) and 6 months (40.0% vs 25.4%, P = 0.002) post-baseline. The longitudinal intent-to-treat analysis showed that the difference in change was significant over time. When defining success more stringently by including only those reporting a full ban and no enforcement challenges, we found again that more intervention than control participants were successful in having and enforcing their smoke-free home rule at 3 months (11.0% vs 5.6%; P = 0.03) and at 6 months post baseline (18.3% vs 8.7%; P =).002) Air quality: Larger reduction in self-reported exposure to SHS in the home among intervention participants at both follow-up points, with a significantly larger decrease in the intervention group. In addition, significantly higher percentage of intervention participants (26.2% vs 18.0%) reported a full smoking ban in cars at 3 months (P = 0.02), although this difference was not observed 6 months post baseline. Smokers in the intervention group reported fewer cigarettes smoked per day at both follow-up points, and the longitudinal analysis indicated that the intervention group had a significantly larger reduction over time. Although observed no difference in cessation rates between intervention and control groups, smokers in the intervention group had a higher number of quit attempts at the first follow-up point, but not at 6 months post baseline. Also found that smokers in the intervention group had higher confidence in being able to quit at 3 months, but not at 6 months. The

Main outcomes (*Continued*)

	longitudinal intent-to-treat analysis, however, showed a significant difference in self-efficacy to quit. Child health: Not reported
Kimata 2004	After 1 month urinary cotinine levels reduced 285±43 $ngmL^{-1}$ to 2.2±0.85 $ngmL^{-1}$ in AEDS cessation group, 257±31 $ngmL^{-1}$ to 1.8±52 $ngmL^{-1}$ in normal child cessation group and 274±42 $ngmL^{-1}$ vs 298±52 $ngmL^{-1}$ in control group of children with AEDS. AEDS children showed significant reduction in SCORAD index skin wheal (mm) from 9.9 baseline to 7.5; Control group 9.6 baseline to 9.3. Also significant changes in response to house dust mite & cat dander & lower neutrophil levels
Krieger 2005	Intervention guided by the transtheoretical stages of change model, as well as by social cognitive theory. Report that 20% of the sample quit smoking and that among smokers who did not go outside to smoke prior to intervention, a quarter did so after education, but data are not provided and it is unclear whether intervention outcomes were different between groups. Homes where smoking was reported as not allowed at baseline 80% (high intensity group) vs 76% (low intensity group) and at exit 77% (high) vs 80% (low) P = 0.33 NS
McIntosh 1994	Number of smokers who moved outside: Intervention 7/30, Control 4/30. Not statistically significant. Urinary cotinine concentrations of children of subjects reportedly smoking outside are above 10.0 in 4/6 (range 6.7 to 54) in Intervention children tested, and in 3/3 (range 12.2 to 21.5) control children tested. These levels suggest significant ETS exposure
Nicholson 2015	ETS exposure: At the end of the follow-up phase, 45.4% of families reported a home ban (intervention: 47.2%; control: 43. 6%) and 20.4% employed a full ban (intervention: 24.5%; control: 16.4%). Group assignment (intervention or control) was not a significant predictor of adopting a home ban. There was a marginal difference between intervention and control groups for the adoption of full bans (OR = 1.81, P = .060) Air quality: Not reported Child health: Not reported
Nuesslein 2006	Calculated nicotine consumption Intervention: 12 micrograms to 4.65 micrograms vs Control: 12 micrograms to 7.5 micrograms NS Urinary cotinine levels Intervention 3520 ng/ml to 741 ng/ml vs Control 4572 ng/ml to 724 ng/ml P > 0.05 NS Across the entire sample (both intervention and control groups) there was an overall reduction in self-reported smoking with average number of cigarettes smoked reduced from 17 to 10 per day and significant reduction in calculated nicotine consumption using self report data 12 micrograms to 5.5 micrograms (P < 0.05), urinary cotinine 4101 ng/ml to 741 ng/ml (P < 0.05)
Ortega 2015	ETS exposure: TSP-avoidance strategies improved more in the intervention group than in the control: 35.4% and 26.9% (P = 0.006) at home, and 62.2% and 53.1% in cars (P = 0.008). Logistic regression showed adjusted ORs for appropriate measures in the intervention group vs control group of 1.59 (95% CI 1.21 to 2.09) at home and 1.30 (95% CI 0.97 to 1.75) in cars Air quality: Not reported Child health:

Main outcomes (*Continued*)

	Not reported
Patel 2012	No significant differences between intervention compared to control groups in: Changed smoking policy: OR2.0 (95% CI 0.166 to 24.069) Reduced no. of cigarettes: OR 4.88 (95% CI 0.785 to 30.286) Quit smoking: OR 1.12 (95% CI 0.346 to 3.590)
Phillips 2012	Where both saliva cotinine and self-report were available, saliva cotinine was used. At eight weeks post-partum, there was a significantly more smoke free mothers in the intervention (81%) compared with the control group (46%) - P < 0.001
Pollak 2015	ETS exposure: Not reported Air quality: Found high rates of cessation but no arm differences in smoking rates at the end of pregnancy (0.31 vs. 0. 30, materials only vs. counselling, respectively) and 12 months after randomisation (postpartum: 0.39 vs. 0. 38). Found high quit rates among non daily smokers but no arm differences (0.43 vs. 0.46 in pregnancy and 0.52 vs. 0.48 postpartum). Among daily smokers, found lower quit rates with no arm differences but effects favouring the intervention arm (0.13 vs. 0.16 in pregnancy and 0.17 vs. 0.24 postpartum) Child health: Not reported
Prokhorov 2013	Smoking status of smoker; 90% on baseline smokers in each group still using tobacco (N = 36 intervention, N = 35 control) Results for the environmental monitors: two monitors - one in a "higher exposure" room than the other. In the high exposure room there was a significant main effect for time (P < 0.001) and time by condition effect (P < 0.05); for the intervention group the mean ambient nicotine level decreased from baseline at 12 months (1.14 μg/m3 to 0.20μg/m3, P < 0.01). There was a decrease in mean of control group but not significant (0.55 μg/ m3 to 0.17μg/m3, P = .99), and a significant difference between average rate of change for intervention and control groups. In the low exposure there was a significant main effect for time but not time-by-condition and similar reductions in the intervention and control groups Percentage of households banning smoking at 12 months: 73% of the intervention group and 56% of the control group
Pulley 2002	Follow-up three weeks post-intervention Cigarettes/day: intervention 16.17 (sd 9.10), control 11.33 (sd 4.69) - P = 0.132 Mothers in the intervention group smoked more at enrolment compared with control group, an effect not present at the 2 week visit (baseline) but present again three weeks post intervention Respiratory illness: intervention N = 5 (42%), control N = 6 (66%) - P = 0.666
Ralston 2008	Counselling strategies based on the stages of change component of Prochaska's transtheoretical model. N = 42, 33% (N = 14) lost to follow-up The quit rate: 14% intervention, 5% control group which did not reach statistical significance
Ralston 2013	Differences between intervention and control groups were not significant (fisher's test): Self-reported quit - control 6/30 (20%, 95% CI 9 to 38%) and intervention 5/30 (17%, 95% CI 7 to 34%); any quit attempt during follow-up - control 11/30 (37%, 95 CI 22 to 55%) and intervention 16/30 (53%, 95% CI 36 to 70%) ; cut down - control 11/30 (27%, 95% CI 22 to 55%) and intervention 15/30% (15%, 95 CI 33 to 67%); used quitline - control 2/30 (7%, 95% CI 8 to 22%) and intervention 0/30 (0%, 95% CI 0 to 13%)

Main outcomes (*Continued*)

Ratner 2001	6 month Follow up: 36% abstinent, 26% occasional, 38% daily smoking. 76% homes smoke-free. 12 month Follow up: 20% abstinent, 35% occasional, 46% daily. 76% homes smoke-free No difference between groups. 6 month Follow up abstinence was 41% vs 30% (intervention vs control) but at 12 months abstinence was sustained in 21% vs 18.5% (intervention vs control) NS. Daily smoking at 6 months was 31% vs 45% (intervention vs control) but at 12 months was 41% vs 50% (intervention vs control). NS Abstinence reported as 38% vs 27% (treatment vs control) NS.
Schonberger 2005	At 6 month Follow up Maternal post-natal smoking Intervention 52% (14/27) vs. Control 28% (8/30) P = 0.04 Partner smoking Intervention 31% (14/44) vs Control 20% 9/45) NS Smoking by others Intervention 47% vs Control 50% NS
Schuck 2014	ETS exposure: Not reported Air quality: Parents who received quitline counselling were more likely to report 7-day point-prevalence abstinence at 12-month assessment (34.0 versus 18.0%, odds ratio (OR) = 2.35, confidence interval (CI) = 1.56-3.54) than those who received a standard self-help brochure. Parents who received quitline counselling were more likely to use nicotine replacement therapy (P < 0.001) than those who received a standard self-help brochure. Among parents who did not achieve abstinence, those who received quitline counselling smoked fewer cigarettes at 3-month (P < 0.001) and 12-month assessment (P < 0.001), were more likely to make a quit attempt (P < 0.001), to achieve 24 hours' abstinence (P < 0.001) and to implement a complete home smoking ban (P < 0.01) Child health: Not reported
Severson 1997	Cessation at 6 & 12 months: Intervention 25/1073 (2.3%), Control 10/802 (1.2%), P < 0.05*, 1-tailed test Cessation at 12 months: Intervention 59/1073 (5.5%), Control 38/802 (4.7%) NS Only 35 of the 97 12-month quitters had quit by six months, with more early quitters in the intervention group (25/59) compared with the control group (10/38). Relapse prevention at 6 & 12 months: Intervention 200/609 (33%). Control 109/417 (26%), P < 0.05*, 1-tailed test Relapse prevention at 12 months: Intervention 261/609 (43%), Control 163/417 (39%) * when controlling for other variables this effect was lost. Significant benefits of intervention on CPD, readiness to quit, likelihood of making a quit attempt, attitude towards smoking, knowledge of ETS effects on children
Stotts 2012	Lower rates of total smoking bans in the usual care-reduced measurement group (P < 0.012 for total ban, P < 0.01 for car) but not significantly different for home alone. 63.6% receiving motivational interviewing had a ban by 1 month post-discharged compared to 20% of the usual care group No significant differences in environmental nicotine monitors measurements
Streja 2014	ETS exposure: No significant difference between intervention and control groups in child urine cotinine levels Air quality: No significant difference between intervention and control groups in any of the measures Child health:

Main outcomes (*Continued*)

	Not reported
Tyc 2013	Group difference for average cigarettes smoked and child SHSe was not significantly different as the 12-month follow-up (P > 0.05). Child SHSe was significantly lower at 12 months from baseline for each group (P < 0. 05). Children's urinary cotinine showed no significant difference, and did not change significantly over time in either group
Ulbricht 2014	ETS exposure: The child urine cotinine level difference between follow-up and baseline was smaller in the control than in the intervention group, but the effect was not significant Air quality: Not reported Child health: Not reported
Van't Hof 2000	There was no statistically significant difference in the smoking relapse rate between women in the intervention (41%) and control (37%) groups
Vineis 1993	Smoking cessation for mothers: Intervention 12/74 vs Control 10/84, OR 1.4, 95% CI 0.6 to 3.5 Smoking cessation for fathers: Intervention 18/173 vs Control 26/244 OR 1.0 showed a trend towards smoking cessation for mothers classified as white collar workers in the intervention arm (5/33) versus the control arm (2/36) (Odds Ratio [OR] 3.0; 95% confidence intervals [CI] 0.6 to 16.0) . No difference was detected for the other participants, comprising 80 blue collar mothers and a total of 411 men defined as white or blue collar workers
Wahlgren 1997	Intensive intervention was able to demonstrate a statistically significant but very small reduction in cigarette exposure from parents' cigarettes reported by parents without biological verification. Mean number of parent cigarettes smoked in presence of child fell in Intervention group: 5.8CPD baseline, 3.4CPD at clinic pre-intervention to 1.2 CPD at 6 months following completion of intervention. In control group, parent reported exposure fell from 8.0 baseline, 5.7 pre-intervention to 4.6 CPD at 6 month follow up. P for trend < 0.01. The effect size was small, however, and curiously, the largest fall in this measure occurred in the period after recruitment but before the intervention. After the intervention, parents reported a reduction of 1.1 cigarettes per day smoked in the presence of the children for the control group, and 2.2 cigarettes per day for the intervention group. There was no validation by measurement of children's exposure or absorption via cotinine, or validation of the parental reports, and the clinical significance of such a fall is unclear Environmental monitor (1 room with heaviest child exposure) measured air nicotine (mcg/ cubic metre). Intervention group baseline 1.7, follow up 1.9 vs Control baseline 2.3, follow up1.4. Measured child asthma symptoms but found no sustained difference between groups for this measure
Wakefield 2002	Home smoking ban: Intervention 41% at baseline, 49% at Follow up vs Control 40% at baseline, 42% at Follwo up. Relative increase in bans not significant; P = 0.40 Car smoking bans: Intervention baseline 33%, Follow up = 52%, Control baseline 37%, Follow up 48%, NS; Low rates of parental cessation, no difference between groups. Urinary cotinine measured for 209 children: Mean cotinine/ creatinine Intervention B = 22.8 nmol/mmol Follow up 21.0, Control baseline 25.7, Follow up 21.0, NS, P = 0.40

Main outcomes (*Continued*)

Walker 2015	ETS exposure: No significant difference between group in urine cotinine level change over time, self-reported SHS exposure, smoking ban, smoking cessation Air quality: No significant change in smoking prevalence and intensity was seen by group Child health: No significant difference in infant cough, acute respiratory illness or rate of hospitalisations between treatment groups
Wang 2015	ETS exposure: Children's urinary cotinine was significantly lower (Z = -3.136; P = 0.002) in the intervention group (1.29 ng/mL) than the control group (1.78 ng/mL). After 6months, reported mean ETS exposure from caregivers decreased 40.6% from baseline among the intervention group and 3.4% among controls Air quality: Caregiver's 7-day quit rate was significantly higher (34.4% versus 0%) (p < 0.001; adjusted OR = 1.13; 95% CI: 1.02-1.26) in the intervention group Child health: Not reported
Wiggins 2005	Mothers living in disadvantaged inner city areas targeted. No significant effect of either intervention. Support health visitor group vs control group, RR 0.86 (95% CI 0.86 to 1.19); Community support group RR 0.97 (95% CI 0.72 to 1.33). Reported no notable differences in child health outcomes for children receiving either post-natal support intervention
Wilson 2001	Of 51 children with complete urinary cotinine: creatinine ratio (CCR) data. Log CCR (ng/mg) Intervention baseline 1.82, Follow up 1.27 vs Control baseline 2.34, Follow up 1.93, adjusted Diff -0.38, adjusted P = 0. 26. Proportion with >1 acute asthma visit/year: Intervention baseline 50, Follow up 29.6, Control baseline 37.2, Follow up 46.5, OR 0.32, P = 0.03 No significant differences in hospitalisation, prohibition of smoking in home, or smoking examined the effect of an intervention targeting smoking behaviour change and asthma education on health care utilisation and asthma hospitalisations, and explored other measures of asthma control. It demonstrated a reduction in the prevalence of children making more than one acute care asthma visit in the year following the intervention. Given that there was no apparent benefit of the smoking-related counselling on smoking-related outcomes, it is likely that it was the asthma education that achieved the improvement in asthma morbidity, rather than the smoking behaviour programme
Wilson 2011	Mean urinary cotinine creatinine ratio (CCR) decreased in both groups (not shown data for 6 and 12 month follow-up). The natural log of the urinary CCR decreased more in the intervention arm but it did not reach statistical significance (B coefficient -0.307 95% CI -0.633 to 0.018, P = 0.64) Decrease in asthma symptoms at follow-up visits in both groups. The decrease in the intervention group did not reach statistical significance (B coefficient 0.035, 95% CI -0.208 to 0.277, P = 0.78) At 12 months 84.0% of the intervention group (N = 142) and 77.1% of the control group (N = 131) had home smoking bans (P = 0.11)
Winickoff 2010	Prevalence of self-reported 7 day abstinence 38% at baseline and 30% at follow up in the control group vs 31% at baseline and 30% at follow up in the intervention group (Effect size = 13% P = NS) Cotinine-confirmed 7 day abstinence for baseline current smokers NS.

Main outcomes (*Continued*)

	For baseline current smokers 18% in the control and 64% in the intervention group reported making a 24hr quit attempt by follow up (P = 0.005)
Woodward 1987	No evidence of effect. Mother self-reported quitting: Intervention 6%, Control 2.2%, P = 0.25. Median infant urinary cotinine levels (mcg/litre): Intervention 11.0 (N = 48) vs Control 10.0 (N = 53), P = NS
Yilmaz 2006	Quit smoking: Child intervention group 24.3%; Mother intervention group 13%; Control 0.8%. (χ^2 = 29.5, P < 0.0001) Smoking location change: Child intervention: 73%, Mother intervention: 46.6%, Control 11.6% (χ^2 = 90. 1, P < 0.0001) Knowledge change (score on MCQ, possible score 0-100): mean post-intervention score in child intervention 63.51 (±7.35 - not stated whether these ± is standard deviations, or 95% confidence intervals) mother intervention 57.69 (±10.46) control 56.68 (±7.67) (ANOVA showed that these scores differed) P < 0.0001 (Note: not an intention-to-treat analysis)
Yucel 2014	ETS exposure: No significant difference between intensive and minimal intervention groups in change in child urine cotinine levels Air quality: No significant difference in any outcome. Child health: Not reported
Zakarian 2004	Low income ethnically diverse population. Both groups showed significant decline in reported exposure to mother's cigarette's/week (intervention group 18.89 at baseline to 5.41 at 12 months, control group 13.25 at baseline to 5.23 at 12 months) (P < 0.001). Total exposure to cigarettes/week (intervention group 53.2 at baseline to 21.99 at 12 months, control 54.48 at baseline to 18.22 at 12 months) (P < 0.001) however, no significant difference between groups. Children's urinary cotinine concentration did not show a significant change over time in either group - No significant difference between groups
Zhang 1993	This was a study designed to increase public knowledge of the health consequences of cigarette smoking and to promote healthier attitudes among elementary school students in China, and encouraged these students to help their fathers to quit smoking. Schools in one district used a tobacco control curriculum, and the control group were students in another district. The other school-based study was a cardiovascular health promotion programme that included an intervention designed to limit children's ETS exposure and negative role modelling from staff and visitors smoking at school (Elder 1996). Conducted in the USA, this study used a cluster-randomized design with schools as the unit of allocation.Number (proportion) of smoking fathers: Intervention baseline 6843/9953 (68.8%) & follow up 60.7% vs Control baseline 6274/9580 (65.5%), follow up "approximately the same" [numbers are not stated] Proportion of fathers who quit smoking for at least 180 days: Intervention 800/9953 (11.7%), Control 14/6274 (0.2%)

APPENDICES

Appendix 1. MEDLINE (Ovid SP) search strategy

Searched February 2017	
1	exp Smoking/
2	Tobacco Smoke Pollution/
3	1 or 2
4	Smoking Cessation/
5	Environmental Medicine/
6	exp Environmental Pollution/
7	Public Health/
8	Health Education/
9	Health Promotion/
10	Psychotherapy/
11	4 or 5 or 6 or 7 or 8 or 9 or 10
12	exp Family/
13	Child Day Care Centers/ or Child Care/
14	Schools, Nursery/
15	(child* or carer* or caregiver* or parent* or brother* or sister* or sibling* or nanny or nannies) .ti,ab
16	12 or 13 or 14 or 15
17	3 and 11 and 16
18	limit 17 to ("newborn infant (birth to 1 month)" or "infant (1 to 23 months)" or "preschool child (2 to 5 years)" or "child (6 to 12 years)")
19randomisedd controlled trial.pt.	19randomisedd controlled trial.pt.
20	controlled clinical trial.pt.
21	randomized.ab.

(*Continued*)

22	placebo.ab.
23	drug therapy.fs.
24	randomly.ab.
25	trial.ab.
26	groups.ab.
27	19 or 20 or 21 or 22 or 23 or 24 or 25 or 26
28	Research Design/
29	Follow-Up Studies/
30	exp evaluation studies/
31	Prospective Studies/
32	Retrospective Studies/
33	Comparative Study/
34	Cross-Sectional Studies/
35	27 or 28 or 29 or 30 or 31 or 32 or 33 or 34
36	18 and 35
37	limit 36 to yr="2007 -Current"
38	(2011* or 2012*).yr,dp,ed.
39	37 and 38

Appendix 2. Embase (Ovid SP) search strategy

Searched February 2017	
1	*smoking/
2	*smoking cessation/

(*Continued*)

3	*environmental health/
4	*pollution/
5	*public health/
6	*health education/
7	*psychotherapy/
8	2 or 3 or 4 or 5 or 6 or 7
9	*family/
10	*schools/
11	*school/
12	*nursery/
13	*nurseries/
14	*day care/
15	*child care/
16	*house/
17	*home/
18	(carer* or caregiver* or parent* or famil* or brother* or sister* or sibling* or nanny or nannies).ti, ab
19	9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18
20	child/
21	newborn/
22	20 or 21
23	1 and 8 and 19 and 22
24randomisedd controlled trial/	24randomisedd controlled trial/
25randomisationn/	25randomisationn/
26	controlled study/

(*Continued*)

27	evidence based medicine/
28	clinical trial/
29	(clin* adj5 trial?).ti,ab.
30	((singl* or doubl* or trebl* or tripl*) adj5 (blind* or mask*)).ti,ab
31	placebos/
32	placebo*.ti,ab.
33	methodology/
34	comparative study/
35	"evaluation and follow up"/
36	prospective study/
37	(control* or prospective* or volunteer?).ti,ab.
38	24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37
39	23 and 38
40	limit 39 to yr="2007 -Current"
41	(2011* or 2012*).yr,dp,em.
42	40 and 41

Appendix 3. CINAHL (EbscoHOST) search strategy

Searched February 2017	
S31	S15 and S29 Limiters - Published Date from: 20110101-20121231; Age Groups: Infant, Newborn: birth-1 month, Infant: 1-23 months, Child, Preschool: 2-5 years, Child: 6-12 years
S30	S15 and S29 Limiters - Published Date from: 20070101-20111231; Age Groups: Infant, Newborn: birth-1 month, Infant: 1-23 months, Child, Preschool: 2-5 years, Child: 6-12 years

(*Continued*)

S29	S16 or S17 or S18 or S19 or S20 or S21 or S22 or S23 or S24 or S25 or S26 or S27 or S28
28	TI (control* pr prospectiv* or volunteer*) or AB (control* or prospectiv* or volunteer*)
S27	(MH "Evaluation Research")
S26	(MH "Comparative Studies")
S25	(MH "Study Design") OR (MH "Cross Sectional Studies") OR (MH "Prospective Studies+")
S24	TI random* or AB random*
S23	TI placebo* or AB placebo*
S22	(MH "Placebos")
S21	TI tripl* n5 blind* or AB tripl* n5 blind* or TI tripl* n5 mask* or AB tripl* n5 mask* or TI trebl* n5 blind* or AB trebl* n5 blind* or TI trebl* n5 mask* or AB trebl* n5 mask*
S20	TI doubl* n5 blind* or AB doubl* n5 blind* or TI doubl* n5 mask* or AB doubl* n5 mask*
S19	TI singl* n5 blind* or AB singl* n5 blind* or TI singl* n5 mask* or AB singl* n5 mask*
S18	TI clin* n5 trial* or AB clin* n5 trial*
S17	(MH "Random Assignment")
S16	(MH "Clinical Trials+")
S15	S1 and S9 and S14
S14	S10 or S11 or S12 or S13
S13	TI (child* or carer* or caregiver* or parent* or famil* or brother* or sister* or sibling* or nanny or nannies) or AB (child* or carer* or caregiver* or parent* or famil* or brother* or sister* or sibling* or nanny or nannies) or MW (child* or carer* or caregiver* or parent* or famil* or brother* or sister* or sibling* or nanny or nannies)
S12	(MH "Child Care+")
S11	(MH "Schools, Nursery")
S10	(MH "Family+")
S9	S2 or S3 or S4 or S5 or S6 or S7 or S8
S8	(MH "Psychotherapy")

(*Continued*)

S7	(MH "Health Promotion")
S6	(MH "Health Education")
S5	(MH "Public Health")
S4	(MH "Environmental Pollution+")
S3	(MH "Medicine, Environmental")
S2	(MH "Smoking Cessation")
S1	(MH "Smoking+")

Appendix 4. PsycINFO search strategy

Searched February 2017	
1	exp tobacco smoking/
2	Smoking Cessation/
3	Environmental Medicine/
4	exp pollution/
5	Public Health/
6	Health Education/
7	Health Promotion/
8	Psychotherapy/
9	2 or 4 or 5 or 6 or 7 or 8
10	exp Family/
11	exp health education/
12	day care centers/ or child day care/
13	Child Care/

(*Continued*)

14	(child* or carer* or caregiver* or parent* or famil* or brother* or sister* or sibling* or nanny or nannies) .ti,ab
15	10 or 11 or 12 or 13 or 14
16	1 and 9 and 15
17	limit 16 to 100 childhood <birth to age 12 yrs>
18	limit 17 to yr="2007 -Current"
19	(2011* or 2012*).yr,dp.
20	18 and 19

Appendix 5. ERIC (ProQuest) search strategy

Searched February 2017
su(smoking) AND (ab("smoking cessation") OR ti("smoking cessation")) AND (su(Pollution) OR su(Environmental influences) OR su(Public health) OR su(health education) OR su(health promotion) OR su(psychotherapy)) AND ((SU(family sociological unit) OR SU(parents) OR SU(child care) OR SU(Nursery schools)) OR pub(child* OR carer* OR caregiver* OR parent* OR brother OR sister* OR sibling* OR nanny OR nannies OR family*) OR ab(child* OR carer* OR caregiver* OR parent* OR brother OR sister* OR sibling* OR nanny OR nannies OR family*))

Appendix 6. Cochrane Library (Wiley) search strategy

Searched February 2017
#1 MeSH descriptor Smoking explode all trees #2 MeSH descriptor Tobacco Smoke Pollution explode all trees #3 (#1 OR #2) #4 MeSH descriptor Smoking Cessation explode all trees #5 MeSH descriptor Environmental Medicine explode all trees #6 MeSH descriptor Environmental Pollution explode all trees #7 MeSH descriptor Public Health, this term only #8 MeSH descriptor Health Education, this term only #9 MeSH descriptor Health Promotion, this term only #10 MeSH descriptor Psychotherapy, this term only #11 (#4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10) #12 MeSH descriptor Family explode all trees #13 MeSH descriptor Schools, Nursery explode all trees

(*Continued*)

#14 MeSH descriptor Child Care, this term only
#15 MeSH descriptor Child Day Care Centers explode all trees
#16 (child* or carer* or caregiver* or parent* or famil* or brother* or sister* or sibling* or nanny or nannies):ti,ab,kw
#17 (#12 OR #13 OR #14 OR #15 OR #16)
#18 (#1 AND #11 AND #17), from 2007 to 2011
#19 (#1 AND #11 AND #17), from 2011 to 2012

WHAT'S NEW

Last assessed as up-to-date: 2 February 2017.

Date	Event	Description
1 January 2018	New search has been performed	Review update: Added 21 new studies, date of last search February 2017
1 January 2018	New citation required but conclusions have not changed	Review update with changes to review authors

HISTORY

Protocol first published: Issue 3, 1999

Review first published: Issue 3, 2003

Date	Event	Description
26 March 2014	Amended	Changed date for 'Assessed as up-to-date'
26 March 2014	Amended	Changed contact to Ruchi Baxi
18 December 2013	New citation required but conclusions have not changed	Added review authors
18 December 2013	New search has been performed	Updated review; added 21 studies; date of last search September 2013
22 June 2011	Amended	Converted additional table to appendix to correct pdf format
8 August 2008	New search has been performed	Updated review

(*Continued*)

3 July 2008	New citation required but conclusions have not changed	Added review authors

CONTRIBUTIONS OF AUTHORS

BB co-ordinated the current review update, extracted data, and wrote and edited the current review update.

MS co-ordinated and co-wrote the previous update, extracted data, and edited the current review update.

RB co-ordinated and co-writing the previous update and extracting data and editing the current review update.

RR co-ordinated the original review, wrote the original review, extracted data for the original review and for review updates, and edited review updates.

PW co-ordinated the current review update, developed the original review and previous updates, extracted data for the original review and for the first update, and edited the original review and review updates.

DECLARATIONS OF INTEREST

BB has no known conflicts of interest.

MS has no known conflicts of interest.

RB has no known conflicts of interest.

RR is a respiratory paediatrician in public and private practice. Many patients he sees have exposure to tobacco smoke. However he does not consider this a conflict of interest.

PW has no known conflicts of interest.

SOURCES OF SUPPORT

Internal sources

- The McCaughey Centre, Melbourne School of Population Health, University of Melbourne, Australia.

External sources

- National Health & Medical Research Council, Australia.
- Murdoch Children's Research Institute, Australia.
- VicHealth (Victorian Health Promotion Foundation), Australia.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We have removed some secondary outcomes from the methods section in the most recent version of this review, as recent versions or the current version did not address them. These include:

- knowledge, attitudes, and beliefs of carers about effects of passive smoking or environmental tobacco smoke (ETS) on self or children;
- participants' views of the intervention;
- measures of anxiety, depression, guilt, stress/locus of control, health, and well-being/health-related quality of life; and
- measures of family functioning.

INDEX TERMS

Medical Subject Headings (MeSH)

*Caregivers; *Family; *Smoking Prevention; Age Factors; Controlled Clinical Trials as Topic; Environmental Exposure [prevention & control]; Smoking Cessation; Tobacco Smoke Pollution [*prevention & control]

MeSH check words

Child; Child, Preschool; Humans; Infant; Infant, Newborn